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VIEWS, NEWS AND INTERVIEWS.

United States Consul Morlan, writing from Belize, British Honduras, states that the municipal board of Belize is contemplating the erection of an electric lighting plant for the streets and public buildings of the city, and he believes there is an opening for an American plant, if tenders are made in competition with English companies. A telegraph line of about 200 miles is also to be erected, and it is expected that a telephone line will be used in connection with it.

A pair of eagles recently lost their lives by alighting on the pole line of the San Joaquin, Cal., Electric Company, causing a short circuit, which resulted in their electrocution.

Mr. Henry R. Quinby, a Rochester, N. Y., electrical contractor, last week made complaint at the District Attorney's office against Police Justice Laverty, of Charlotte, charging him with highway robbery. Mr. Quinby put in the electric light plant for the Ontario Beach Improvement Company at Charlotte, and went to the power-house complaining that the company had violated its contract, and took away two brush-holders, thus rendering the dynamo useless. Justice Laverty, who is manager of the plant, followed him up, and on Quinby's refusing to surrender the brush-holders, with the assistance of two policemen overpowered Quinby and took them away. Quinby now threatens to bring the matter before the Grand Jury.

A man of the name of Karstens, formerly a lineman, was killed by a live wire in Newark the other day. His own foolhardiness caused his death. In front of a saloon frequented by Karstens is a distributing pole of the telephone system. It is 75 feet high, and at the top there is a circular platform from which the wires diverge. Karstens had occasionally climbed to the platform and there sang German songs to his friends below. He was always under the influence of liquor when he did this, but he invariably escaped injury. Twenty-five feet from the ground the pole carries a crossarm holding a number of electric light wires, between which Karstens crawled in going up and down the pole. He climbed the pole once too often, took hold of one of the electric light wires and was shocked so that he fell to the ground and was killed.

Superintendent E. C. Foster, of the Lynn & Boston Railroad Company, issued this order on July 26:

> On and after this date, conductors and motormen, in addressing women passengers, shall substitute the word "Madame" for "Lady."
> E. C. FOSTER, Superintendent.

The new order is made by the company for the reason that uniformity in addressing women patrons is desired, and it could not be brought about in any other way than by edict.

A press cablegram from London, dated July 27, says that the Reuter Telegram Company has been circulating a ridiculous story to the effect that Marconi is contemplating applying wireless telegraphy to exploding magazines against distant warships and automatically synchronizing watches in people's pockets. Professor Crookes, when questioned on the subject, demonstrated the impossibility of doing such things, and characterized the story as the irresponsible chatter of an unsophisticated reporter.

It was announced last week that the Chicago City Railway Company has decided to change the motive power on its cable lines to electricity.

Mr. Day, Assistant Secretary of State, has mailed a letter to all the ambassadors and ministers of the United States asking them to obtain information as to the nature and practical workings of the postal telegraphs, telephones and postal savings banks of such countries as have adopted them.

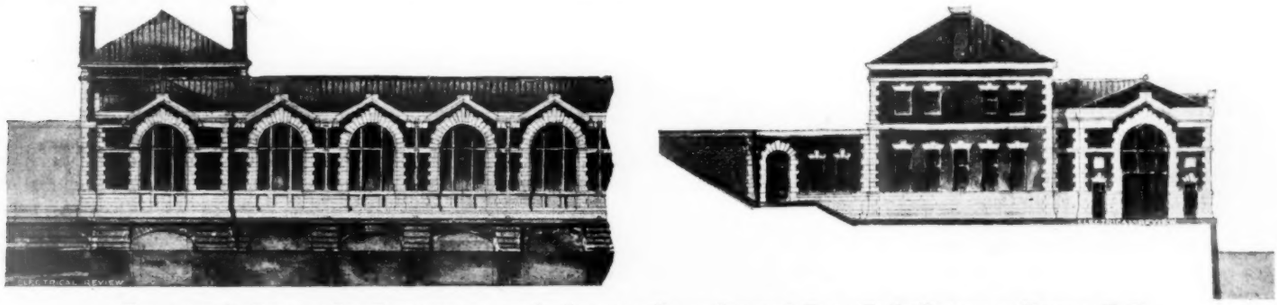
It has been remarked that among the thousands of telegraphers in the United States in the employ of the Associated Press and the minor news-gathering bureaus, there are but two women operators. They are Miss Mary J. Macauley, at present with the Auburn, N. Y., *Daily Advertiser*, and Miss Beda L. Arnold, with the Bridgeport, Ct., *Standard*.

The Caracas Electric Light, Heat and Power Company was incorporated at Trenton, N. J., on July 28, with a capital stock of $1,000,000, to be fully paid up when business is begun. The company will build and operate electric plants and a railroad in Venezuela and other South American countries. John E. McEwan, of Brooklyn; Charles C. Drew, of New Brighton, S. I., and Robert Weinmann, of Jersey City, are incorporators.

ELECTRIC POWER FROM THE ST. LAWRENCE RIVER.

THE GREATEST ELECTRICAL GENERATING PLANT IN THE WORLD TO BE ESTABLISHED AT MASSENA, N. Y. —SPLENDID NATURAL FACILITIES OF THE LOCATION—THE CANAL AND POWER-HOUSE—NEW FORM OF GENERATORS—FIRST PUBLICATION OF DETAILS CONCERNING THIS IMPORTANT PROJECT.

Several months ago the ELECTRICAL REVIEW announced the organization of a company for the commercial development of electric power from the waters of the St. Lawrence River, near Massena, N. Y. A short time ago a representative of this journal visited the Westinghouse interests at Pittsburgh, and obtained information of the large contract placed with them for electrical apparatus for use in this connection. Further than that, the projectors and those interested in this work have been reticent as to furnishing information, which was quite natural in view of the magnitude and importance of the operation. The ELECTRICAL REVIEW, however, has been favored with complete and official information of the technical, financial and business arrangements of the company, through the courtesy of Messrs. Stewart & Company, bankers, of Wall street, New York; the information relative to the engineering features and construction work,



FIGS. 1 AND 2.—SIDE AND END ELEVATIONS OF THE ST. LAWRENCE POWER COMPANY'S PLANT TO BE ERECTED AT MASSENA, N. Y.

through Mr. John Bogart, engineer, and also the description of the electrical apparatus from Mr. B. F. Warren, second vice-president of the Westinghouse Electric and Manufacturing Company.

Messrs. Stewart & Company are the owners of the St. Lawrence Power Company, and through their efforts bonds to the value of $3,000,000 have been placed with a strong English syndicate in London for developing what will be the largest electrical and hydraulic power plant in the world. Bonds to the value of $3,000,000 have been issued with the United States Mortgage and Trust Company, of New York, and Messrs. Matheson & Company, the London bankers, as co-trustees. This $3,000,000 of bonds has all been taken by the London syndicate, and in the face of the uncertain feeling which has existed in England in relation to American securities, it is gratifying to know that Messrs. Stewart & Company have been so successful in interesting the London market in this promising enterprise.

The St. Lawrence Power Company is a corporation organized under the laws of the State of New York, with a capital stock of $6,000,000, and the company is owned jointly by an English syndicate, who are represented in this country by Seward, Guthrie & Steele, of 40 Wall street, and Stewart & Company. The officers are Wm. C. Lane, president; S. H. Gardyne Stewart, vice-president; Carlton H. Reeve, secretary, and Wm. C. Cox, treasurer.

Since the first of the year the company has been actively engaged in perfecting plans for the construction of the plant, and contracts have been closed with the following firms and companies for the carrying out of the work as follows:

Excavation of canal, building of power-house, intake and outlet construction, etc., with the Lehigh Construction Company, Limited, of South Bethlehem, Pa. Fifteen 5,000-horse-power generators, the Westinghouse Electric and Manufacturing Company, of Pittsburgh, Pa. Fifteen 5,000-horse-power turbines, the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio.

The engineering work is under the charge of Mr. John Bogart, of New York, and Messrs. Kincaid, Waller & Manville, of London, as consulting engineers. Work has already begun, and the engineering and construction will be completed in December, 1898.

A large proportion of the power to be generated has already been taken by a syndicate which proposes to use it principally for electro-chemical manufacturing purposes. While the great strides made by Nikola Tesla in the development of economical transmission devices render it quite possible to transmit this power to distant manufacturing centers, the indications are, however, that little, if any, of the power will be available for that purpose, as the demands have already materialized to such an extent as to justify the belief that it will all be used in the immediate vicinity of the power-house.

Unique physical conditions have made possible a great development of power at Massena with comparatively moderate outlay. The elements necessary for use of water-power are: Water in ample volume, and fall practically available. With very great height of fall a moderate volume of water will produce the same amount of power as a much greater volume with much less height of fall. The volume must be constant to the extent required in order to secure continuous power. Many streams which have considerable falls have so great variations in the volume of flow as to render only very moderate developments of power practicable throughout the whole year. At Massena the volume of the St. Lawrence River is so great as to render certain constant continuous power to an extent far beyond anything that the world has ever attempted.

The physical conditions are: The St. Lawrence River carrying the enormous volume of water gathered from all the great American lakes, and having at Long Sault Rapids a fall of over 50 feet. Southerly from the southern shore of the St. Lawrence, above these rapids, there extends a comparatively level plateau of about three miles, where it meets the valley of the Grass River, as will be seen by referring to the map, Fig. 3. The curving line, which is marked out in this map, was originally planned for the canal, but the accepted course is the straight line connecting the St. Lawrence and Grass rivers, the water of which at this point is about 45 feet below that of the St. Lawrence above the rapids. The Grass River has but a small volume of flow and enters the St. Lawrence below the rapids. A canal carrying the waters of the St. Lawrence from a point above the rapids to the valley of the Grass River will deliver that water upon turbine wheels, with an absolute head of over 40 feet. This water, after actuating the turbines, will flow through the valley of the Grass River and re-enter the St. Lawrence below the rapids. The head-race of this power will thus be the St. Lawrence River and three miles of canal; the tail-race will be the Grass River itself. After careful consideration of the commercial requirements that can be depended upon to utilize power at this point, the St. Lawrence Power Company has determined to construct a canal across this plateau of such size as to carry sufficient water to the valley of the Grass River to develop 150,000 horse-power, and to at once build at the Grass River a power-house, and to furnish it with turbines and electric generators sufficient to develop, before the close of the year 1898, electricity to the extent of 75,000 horse-power. There will be thus available for future use sufficient water to double this immediate output, and this can be used either in direct power for mills or other manufactures, or can be transformed into electricity.

The size of the canal for which contracts have been made and work upon which is in progress, will be 225 feet wide and 25 feet deep. The sides will have slopes adapted to the material through which the canal passes. The line of the canal is nearly straight from one river to the other. It is entirely in cutting, thus avoiding the dangers incident to embankments. The volume of material to be excavated is large, but as the excavation is entirely in earth, the expense will be very moderate, as compared with its great volume. The Grass River flows upon a limestone formation, but the plateau between it and the St. Lawrence River is entirely alluvial, the material being sand, clay and gravel. The head of the canal at the St. Lawrence River is immediately below a slight promontory, which deflects to the opposite shore the ice and drift coming down from the upper river and the lakes. The banks of the Grass River, where the canal approaches them, are over 40 feet in height. The power-house will be founded immediately upon the rock bed of the Grass River and will receive the water for power from the canal, which terminates in the elevated bank behind the power-house. This power-house will be between 500 and 600 feet long and 130 feet wide. The rock in the bed of the Grass River will be excavated so as to afford ample area for the outflow of the water from the turbines. The power-house will be founded upon masonry piers built upon this rock.

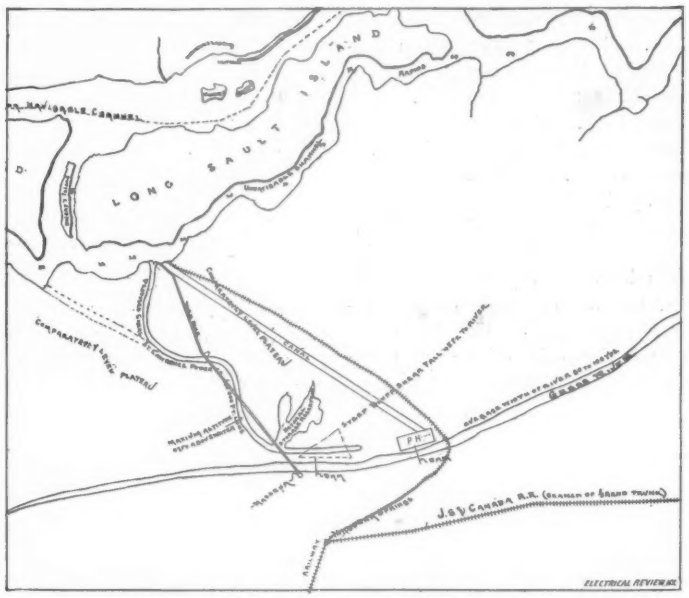


FIG. 3.—MAP SHOWING LOCATION OF THE ST. LAWRENCE POWER COMPANY'S CANAL AND PLANT. POWER-HOUSE DESIGNATED BY "P. H."

The construction of the power-house is included in the contract for the canal and its turbines. This contract has been made with the Lehigh Construction Company, and work has been already begun at a number of points along the line of the canal and at the power-house.

The turbines to transform into moving power the weight of the column of water will be upon horizontal shafts. There will be two twin turbines upon each shaft, it requiring four turbines to produce the power and speed required. These turbines will develop upon each shaft 5,300 horse-power. The turbines will be of the Victor type, made by the Stillwell-Bierce & Smith Vaile Company, of Dayton, Ohio.

The water from the canal enters the turbine chambers through suitable screens, and after passing through the turbines is conveyed by separate passage for each set of turbines under the floor of the power-house and out into the Grass River.

The horizontal shaft of the turbines is extended through the wall of the turbine chamber and into the power-house and still further extended in a direct line, becomes the shaft of the revolving parts of the great electric generators. Each unit of power developed is thus 5,300 horse-power transformed by the generators into 5,000 electric horse-power. There will be in the portion of the power-house now to be built 15 of these systems or units of power, each of 5,000 horse-power capacity, thus developing in the power-house 75,000 electrical horse-power.

The unit of 5,000 horse-power is the same as that adopted for the works of the Cataract Construction Company at Niagara Falls. The construction of both the turbines and the generators is, however, quite different, the fall of the works of the St. Lawrence Company being less than, and the volume of water greater than, at Niagara. Both the turbines and generators at Niagara are upon a vertical shaft of over 150 feet in length, while the turbines and generators at Massena are upon a horizontal shaft of about 80 feet in length.

The power-house, shown in Fig. 1, will be of good architectural design. It will rise to a height of about 60 feet above the water of the Grass River, and have an electric crane traversing its whole length and with lifting capacity of 85 tons. There will also be in the power-house three separate turbines of smaller power, which will actuate the three exciter dynamos required for the operation of the larger generators.

The head of the canal will be protected by gates, and will be so arranged as to permit the passage into the canal of large lake vessels. Should it be deemed desirable in the future to erect a lock at the front of the canal below the power-house, this

would give a passage for vessels around the Long Sault Rapids of the St. Lawrence.

The St. Lawrence River is divided into two branches by the Long Sault Island, which island is in the State of New York, the international boundary being in the center of the channel north of that island. The water of this power canal is thus taken entirely from that part of the St. Lawrence River within the boundaries of the State of New York. The volume of water passing down this channel is very great. The use of the water for this power does not in any way interfere with navigation, as it is returned to the St. Lawrence River directly below the rapids. Navigation on the Canadian side is provided for by the Cornwall Canal, which extends from above the rapids to some distance below them at the town of Cornwall, Canada.

The contract for the electrical apparatus for 15 5,000 horse-power dynamos with the Westinghouse Electric and Manufacturing Company involves the largest deal ever consummated. These machines are of the same capacity as those at Niagara Falls, which are the largest machines that have ever been built; in fact, no other electrical machines exceed 2,500 horse-power in capacity. A machine of 5,000 horse-power involves the highest class of electrical and mechanical design, and Americans can point with pride to the fact that the only machines of this size which have ever been built or undertaken have been by an American company. There are many obscure and difficult points to be determined regarding the proportions of the iron and the windings in such a machine, and the large size and the great strains brought on the shaft and other parts of the machine are much more difficult to determine than in machines of ordinary size.

The machines for the St. Lawrence Construction Company are not only of large size, but they involve a new design, and are in many ways different from other machines. Each of these great machines will weigh about 350,000 pounds, the weight of one piece being as great as 125,000 pounds. The machines will stand 22 feet high above the top of the foundations, and each machine will occupy a floor space of 22 feet by 18 feet.

The machines have horizontal shafts which are in line and are directly connected with the shafts of the water-wheels by which they are driven. The shaft of a dynamo carries a great ring of steel which is very similar to a large and heavy fly-wheel. This steel ring carries at its circumference 20 external projecting pole-pieces. The ring and the pole-pieces are of one solid casting of steel. The ring has an extreme diameter of 15 feet and is about three feet wide.

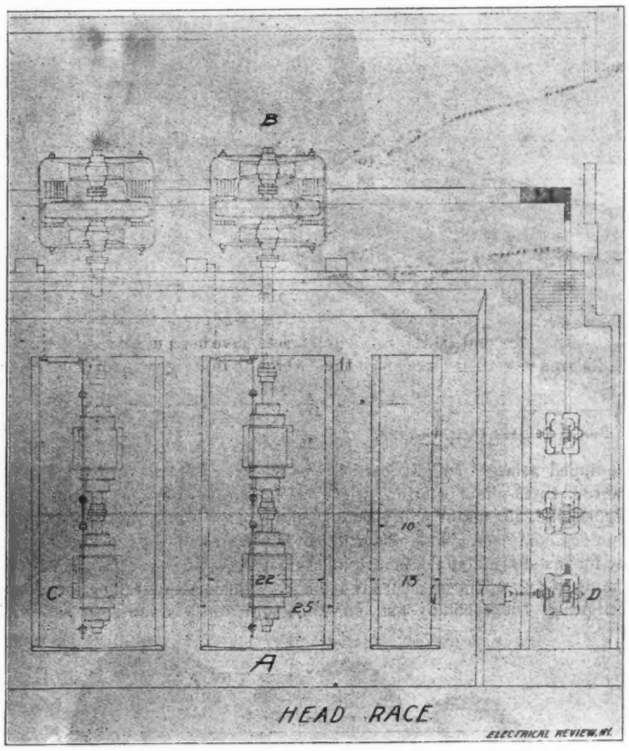


FIG. 4.—PARTIAL PLAN, SHOWING ONE END OF THE ST. LAWRENCE POWER COMPANY'S PLANT.

It is supported from the shaft by a massive cast-iron hub with 10 great radial arms or spokes. The steel for the ring is designed for very great strength, it revolves at a speed of nearly two miles a minute and the centrifugal force is such that each pound at the circumference tends to fly outward with a force of nearly 100 pounds. The speed of the machine is 180 revolutions per minute.

This great steel ring with the projecting poles revolves inside of a large stationary ring or cylinder, whose inner surface is made of plates of thin soft steel on edge. These thin steel plates are held by a massive outer ring of cast-iron, which has a total height of 22 feet. The thin steel plates which form the inside of the stationary part have slots in which are laid copper bars parallel with the shaft of the machine. These bars are insulated with mica, and in them are generated the currents which the machine produces. These currents are produced by the revolutions of the poles or projections on the revolving inner steel ring. Around each of these projections there is a coil of copper strap, of which each turn is insulated from other turns and from the steel pole by mica. A current is sent through the coils on these polar projections, which strongly magnetizes the poles. The revolution of these magnetic poles in front of the copper bars in the outer part of the machine induces currents in them. These currents are alternating currents, which are continually reversing in direction at the rate of 3,600 times per minute. Three conductors are carried from the machine, which is wound for giving three phases. The currents in the different conductors do not occur at the same time, but have their maximum values in regular succession.

The currents from the machines are carried by heavy copper conductors to a switchboard. The various machines can be connected by switches to a common set of copper bus-bars. Circuits lead out from the power-house for distributing the current.

Current from these machines may be used for various purposes; it is suitable for lighting and for heating; it can be used for driving alternating-current motors for running factories and machine shops; it can be used for electrical fusion, in which intense heat is produced in great electrical furnaces; it can be used for electrolytic work, in which a chemical action takes place. These operations are used in such electrical industries as the manufacture of aluminum, of calcium carbide for making acetylene gas, of carborundum, of sodium, potash, etc. The current for the electrolytic work is transformed from the alternating into direct current. A similar transformation is made for obtaining direct current at 500 volts, for operating street railways.

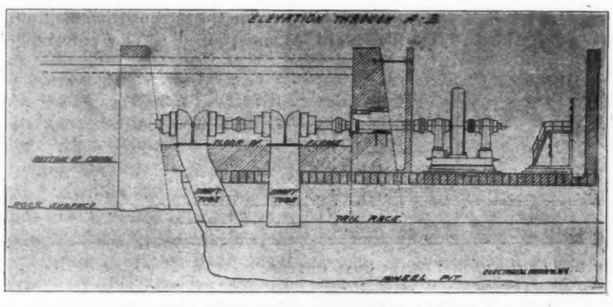


FIG. 5.—ST. LAWRENCE POWER COMPANY'S PLANT. SECTIONAL ELEVATION THROUGH A B. (See Fig. 4.)

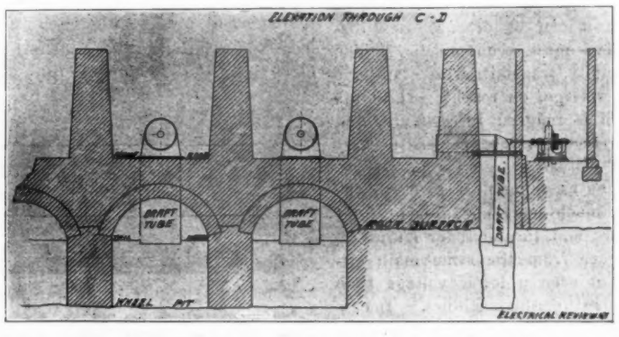


FIG. 6.—ST. LAWRENCE POWER COMPANY'S PLANT. SECTIONAL ELEVATION THROUGH C-D. (See Fig. 4.)

A Switch Patent Sustained.

In the United States Circuit Court, at New York City, on July 28, Judge Lacombe handed down a decree in the action of the Bryant Electric Company against the Cutter Electrical and Manufacturing Company and Charles D. Doubleday, declaring the patent No. 391,512, granted October 23, 1888, to William B. Cleveland for an improvement in electrical switches, good and valid; and perpetually enjoined the defendants from selling or using the invention described in the patent.

American Electrical Works' Clam Dinner.

The electrical fraternity has received from Mr. Eugene F. Phillips, president of the American Electrical Works, Providence, R. I., invitations to the nineteenth annual clam dinner, tendered by Mr. Phillips to his friends and customers in the electrical business. The affair will occur on Saturday, August 21, at the Pombam Club, near Providence. Lunch will be served at 11.30 A. M., and the bake will open at 2 P. M.

Carborundum Infringement Suit Dismissed.

Judge Buffington, in United States Circuit Court, at Pittsburgh, has filed an opinion dismissing the bill in the suit of the Cowles Electric and Smelting Company against the Carborundum Company. An infringement of a patent on the manufacture of carborundum was claimed.

ELECTRICITY IN MINING.

ADVANTAGES OF THE ALTERNATING CURRENT.

The comparatively recent developments in the manipulation of alternating-current electricity have, in broadening the whole field of electrical application, extended the use of the current also in the mining industry, and given to the mine operator a system extremely efficient and flexible, both in its distribution and adaptation. The alternating current possesses one great advantage, among others, which no other system presents, in the ease with which the voltage may be varied. This is done by means of transformers, and allows the electricity to be transmitted at a high voltage, and, consequently, cheaply, over long distances, to be transformed down at the point of utilization. It also allows of the use of motors which, equally effective in their performance with direct-current motors, are free from commutators and moving contacts, and, consequently, from sparking, as well as from other shortcomings.

To the mine operator the alternating-current system, or rather a modification of it, known as the three-phase system, offers special advantages. Mines many miles apart may be operated by current generated at a single central point, situated where it can be procured and distributed most economically. The electricity, transmitted at a suitable high voltage, on reaching the mine mouth is reduced in pressure, and the wires taken down the shafts carry a low-voltage current only. It can then be used not only to drive the mine machinery, but also to light the arc and incandescent lamps on branches from the same main circuits at even a lower voltage than that used for the machines. In case continuous current is required in lieu of alternating, as for the operation of mine locomotives, the alternating current can be converted into continuous, in a rotary converter, and the voltage of the latter current regulated to the necessary pitch for the new use. Furthermore, although three wires are used with the three-phase system, and two with the direct, the cost of the three wires is one-quarter less than that of the two wires, allowing the same loss in transmission and using the same initial voltage.

The development of electric mining machinery, to be operated on the three-phase system, has been carried forward vigorously by the General Electric Company; and, convinced of the advantages of the system, while recognizing the need of propaganda, it equipped a large freight car, as a central three-phase station, with boiler, engine, alternator and station equipment complete. This was held ready for installation at the mouth of the mine of any operator desirous of investigating the economy and efficiency of the system. The installation made, station and mine apparatus were left with the operator. He was then placed in a position to watch both generating and operating machinery and judge for himself. This car was never long out of requisition.

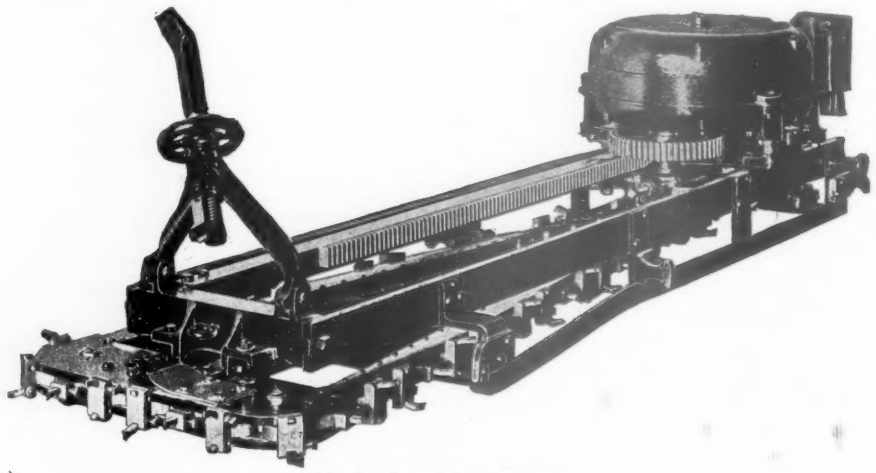


FIG. 1.—CHAIN COAL CUTTER.

To the cutting of coal by machinery, the three-phase system seems peculiarly suited. The chain coal-cutter, illustrated, shows the latest type—a stationary frame and traveling carriage carrying the motor, driving gear, feed gearing and cutting chain. The motor is an induction motor laid on its side. It has neither commutator brushes nor moving contacts, and, as it can not spark, can be used in gaseous or dusty mines, where a spark might result in a costly disaster. The windings of the motor are stationary coils imbedded in metal and protected from injury, and as these coils are separately formed and insulated, they may be readily removed and replaced. The motor is entirely inclosed, and no starting box being necessary, complete control is given by a simple inclosed switch. The motor stops work the moment it is overloaded, and the machine is thus subjected neither to strain nor breakage. The shaft of the motor is vertical and runs at a low speed, allowing the chain sprocket wheel to be driven by a single reduction spur gear, thus avoiding on the main drive both worn and bevel gears. The feed gearing is driven by a worm at the lower end of the armature shaft. The backward thrust of the feed gearing is taken by a single rack so located as to compensate largely for the side thrust of the chain as it cuts the coal. Into this rack mesh two pinions, one for the forward and one for the backward motion of the carriage. The reverse lever at the back of the machine throws clutches in or out of these gears, and is arranged to throw automatically when the end of the cutter travel is reached. A characteristic feature of this cutter is the small amount of gearing employed and the reduced number of wearing parts.

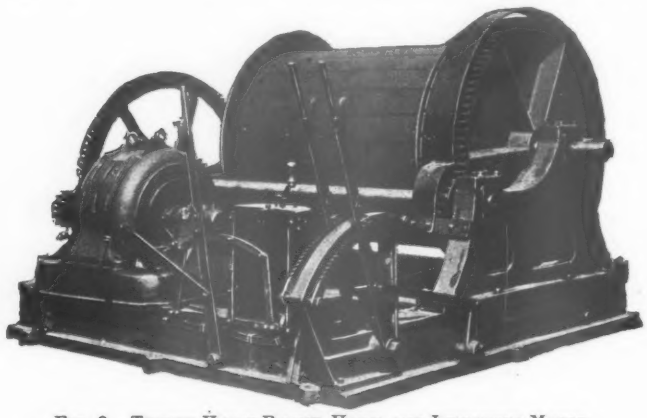


FIG. 2.—THIRTY HORSE-POWER HOIST AND INDUCTION MOTOR.

The chain is arranged to take three shapes of bits, each form cutting grooves about one and one-half inch deep, separated from the next groove by a ridge of coal, which is broken down by the links. The cut is about four inches high by 36 inches wide, and the bits made in the form of an arc of a circle can be set out as required. This gives a great advantage in sharpening, as no part of the bit, except the cutting edge, needs redressing, and all of the steel may be used up. The chain is built to stand the strain and the vibration of the cutter. The bit links are of tough phosphor-bronze, and the strap links are steel drop forgings of such shape as to bring all the strain directly upon the solid forgings and not on the rivets.

In rooms where the proper clearance can be obtained, this coal-cutter can be shifted or moved from the first position ready for the second cut in an average of two minutes, it being understood that the props are away from the face, the floor reasonably smooth and the face of the coal properly squared. The time of loading and moving the cutter from room to room will average about 15 minutes, provided the rooms are adjacent. The time required for setting the bits will average 10 minutes. The cutter has, in favorable coal where other conditions were rather unfavorable—such as roof, props, track, etc.—been able to average eight cuts or runs, each 36 inches wide, per hour, or at the rate of 240 lineal feet per 10-hour shift. The conditions can scarcely be so unfavorable that it will not always be able to average at least four runs per hour.

An approximate idea of the number of machines required for any particular mine can be obtained from the following formula, which gives the tonnage output:

Number of feet-face per 10-hour shift by depth undercut by height coal equals 27 cubic feet equals number of tons run of mine coal.

To reduce this to lump coal, the percentage of fine coal that passes through the screens from pick mining is ascertained. The percentage of lump from the machine will then be 25 per cent greater than when produced by pick or hand labor. The amount of powder to shoot or break down the coal is also largely decreased. Any coal that would require ordinarily an 18-inch cartridge to break down will require, when the same coal is properly undercut with the machines, an eight-inch cartridge for the same or a greater amount of coal.

Accompanying the cutter is the electric mining pump, which presents

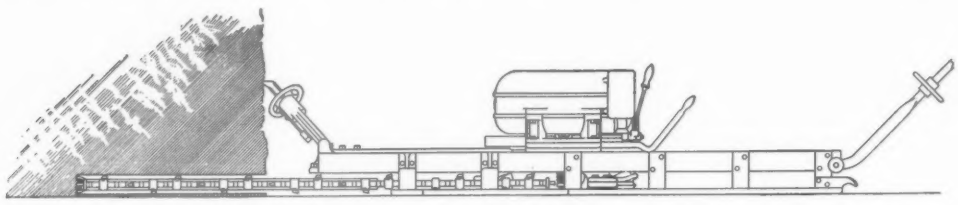


FIG. 3.—METHOD OF OPERATING CHAIN COAL CUTTER.

the great advantage of portability, which renders the electric pump superior for mine work to pumps driven by any other method. With an electric pump, the pump-shaft is free from all machinery. It contains only the conductors and discharge pipes. Indeed, the three-compartment shaft, so common in mines, one for pumping and the other for hoisting, can by the use of the electric pump be reduced to two, as the discharge pipes and wires, which occupy so little space, can be placed in one of the hoisting compartments. Furthermore, with an electric pump, deleterious and often disastrous effects inseparable from the use of steam are absent. Moreover, the three-phase pump requires no attention beyond an occasional oiling, and needs no attendant to start or stop it. It can be operated by a switch from the engineer's office at the mine mouth.

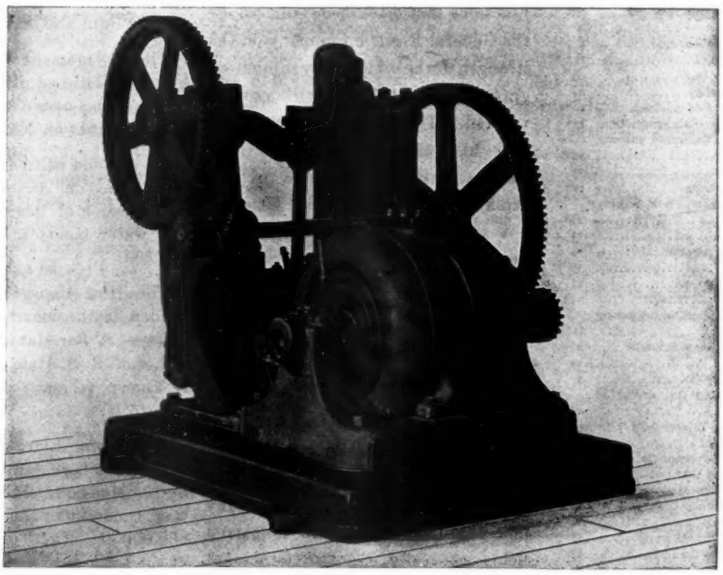


FIG. 4.—THREE-PHASE VERTICAL TRIPLEX PUMP DRIVEN BY A FIVE-HORSE-POWER INDUCTION MOTOR.

There are different types of electric mine pumps, but the three-phase pump presents features of excellence similar to those noted in the coal-cutter. Our illustration shows a Knowles four-inch by six-inch vertical triplex pump, with a capacity of 60 gallons a minute against 300-foot head. It is driven by a sparkless induction motor of five horse-power capacity, mounted on the same bed plate as the pump and driving it through a double reduction. The weight of the motor and pump complete is about 2,480 pounds. Another type of three-phase pump is shown in Fig. 5. This is a Knowles 7¼-inch by 12-inch double-acting horizontal triplex pump, having a capacity of 600 gallons a minute against a head of 200 feet. The motor is also of the sparkless induction type, but of 75 horse-power capacity, and the outside dimensions of the combination of motor and pump are nine feet high, six inches wide and 25 feet six inches deep. This mine pump is now in use in Mexico.

This description of three-phase mining machinery would be incomplete without an illustration showing the application of the induction motor to the hoist. Fig. 2 is rated at 3,300 pounds at 200 feet per minute. The drum is four feet in diameter and five feet between flanges. It is fitted with friction clutch and usual hand-brake, and is stopped, started and reversed by a cylindrical switch or controller. The lever at the left of the controller is connected to the resistance switch by a cam, and is used for short-circuiting the resistance in the armature as the motor comes up to speed. The motor is a standard General Electric 30-horse-power motor, with the denomination of 8, 30, 900.

Generally speaking, the use of electric mining machinery reduces materially the amount of dead work, and in the case of the cutter, reduces the amount of haulage. These two factors alone result in a decreased cost of mining, and although it is difficult to state the extent of the saving, the practical operator will be able, without effort, to realize the benefit derivable from the use of electric mining machinery. Beyond those already mentioned the following may be enumerated: Ventilating fans may be placed in any part of the mine and be driven by motors; partitions can be lighted by incandescent lamps; the coal can be hauled by electric locomotives, and all with no greater encumbrance in the mine workings than some small wires strung on porcelain conductors out of sight, almost on the roofs.

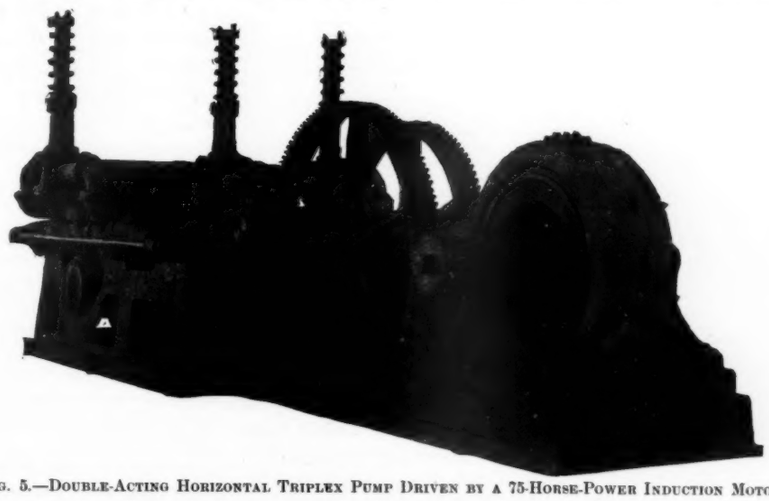


FIG. 5.—DOUBLE-ACTING HORIZONTAL TRIPLEX PUMP DRIVEN BY A 75-HORSE-POWER INDUCTION MOTOR.

ELECTRIC RAILWAY NOTES.

Barcelona is to have a system of electric tramways 40 miles in length, connecting it with the surrounding districts. It will be built by a British company on the overhead system, and will cost about $5,000,000.

Thieves recently stole 1,900 feet of copper bond wire from the tracks of the Bridgeton, N. J., & Millville Traction Company. It was cut off with axes at a point about four miles from Bridgeton. This is the third time the company has been robbed in this way.

The Mansfield & Easton, Mass., proposed street railway is now in the hands of the promoters of the Mansfield, Norton, Taunton & Attleboro system. The stock has been subscribed and the company propose to push the preliminary work required by law with due diligence.

Kansas City is planning to borrow from the fuel supply of Leavenworth, Kas., and operate a sort of an electric trunk line between the two cities to supply motive power to the Kansas City manufactories and street railways. Arrangements have been made to build a $1,500,000 plant at Leavenworth. Western capitalists are said to be associated with Leavenworth's richest men in the project.

The stockholders of the Augusta, Me., Hallowell & Gardiner Electric Railroad at their annual meeting elected the same board of directors as last year, which organized later as follows: President, Hon. J. Manchester Haynes; treasurer, Hon. Geo. E. Macomber; secretary, Col. H. G. Staples; Hon. O. D. Baker, G. A. Cony and Thomas J. Lynch being the other members of the board.

The stockholders of the Rutland, Vt., Street Railway Company has re-elected the board of directors. The board consists of J. W. Cramton, S. M. Willson, M. McKeogh, N. K. Chaffee, F. R. Patch, E. C. Tuttle, T. W. Moloney, Frank C. Partridge and G. T. Chaffee. The directors re-elected these officers: President, J. W. Cramton, secretary, S. M. Willson; treasurer, N. K. Chaffee, and superintendent, M. McKeogh.

The Bluff City, Wis., Electric Railway, which has secured franchise rights through Lake Forest, hopes to have cars running all the way from Waukegan to Chicago by next Spring. It has not yet secured a route into Chicago from Evanston, and it is not probable that it will build one. Instead, the present plan is to make a contract with the Northwestern elevated road, by which the track of the latter can be used from Evanston south.

The Southwest Missouri Electric Railway will soon be equipped with a telephone system and a dispatcher placed in charge of the cars, directing their movements from the company's office in Webb City. Telephones will be fixed in each car, with a device for making instantaneous connections with the wires at switches, so that every car can get instructions at every switch passed. Such a system will reduce the danger of wrecks and unnecessary delays to a minimum. The only expense after putting in the system will be the salary of the dispatcher.

A $30,000 telephone plant is to be erected in Washington County, Md., connecting all the towns with Hagerstown. A Baltimore syndicate is in charge of the enterprise.

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The progressive men connected with the electrical field believe in conventions. A few weeks ago the National Electric Light Association held its convention at Niagara Falls; the Superintendents of Telegraph of the Railroads of the United States held their convention at the same place a week later; week before last the Northwestern Electrical Association assembled in Wisconsin; and last week the American Institute of Electrical Engineers held its annual gathering in Maine. Numerous other conventions are to be held during the Summer and the new telephone association which was formed at Detroit recently, will probably hold another convention this Fall. The electrical people believe in getting together and the ELECTRICAL REVIEW fully indorses this belief.

THE TROLLEY DECISION AND WHAT MAY RESULT.

The United States Circuit Court of Appeals on July 22 decided that the Van Depoele trolley patent was invalid. This is an important decision of value to all electric railway interests outside of those represented by the General Electric and Westinghouse patent agreement. The injunctions that have been secured by the General Electric Company on the strength of the preliminary injunction granted by Judge Cox will now be vacated. The suit in question was brought by the General Electric Company against the licensees of the Walker company, and the latter is now very naturally rejoicing over the victory. It is not known yet whether the case will be appealed to the Supreme Court or not.

While the patent was an important one, and so considered by the General Electric, the decision apparently had no effect on the stock of that company, as it recorded a two-point rise last week. The important foreign business recently secured by this company and the improvement in industrial fields generally are two important factors in this improved condition of the General Electric Company.

The announcement is made on first authority that the Fort Wayne Electric Corporation has arranged to actively enter the street railway field. Mr. R. T. McDonald, the active head of this company, is negotiating for a large increase of capital and very extensive work in this line. For a few years past the General Electric Company has been paying a large royalty to him on account of the Wenstrom electric railway patents which prevented him from entering in competition in this field. This agreement lapsed a short time ago, and as it was thought then that the Van Depoele patents largely controlled the field, the General Electric Company did not care to renew the agreement. Since the trolley patent has been declared invalid it is understood that negotiations were begun for the renewal of this contract with the Fort Wayne Electric, but they were declined.

The electric railway field is most productive, most promising and very attractive to capital, and we expect to see within the next few months much more competition on the part of manufacturers for the business to be found here, and a corresponding extension of electric railway work.

The fourteenth general meeting of the American Institute of Electrical Engineers, held last week at Eliot, Me., was an enjoyable and profitable occasion. While the attendance was small, those who met there were all enthusiasts in their work and in science.

LATE NEWS.

The annual meeting of the Boston Electric Light Company will be held on August 10.

At a special election the citizens of Lewes, Del., voted to issue $10,000 electric light and water bonds. Bids on the work are desired.

It is reported that the citizens of Scranton, Pa., have voted in favor of the issuance of $25,000 bonds for an electric light and water plant.

The management of the South Side Elevated Railroad of Chicago expects to commence operating the road with electric power on November 1, 1897.

An election will be held at Monroeville, Ohio, on August 17 to decide the question of issuing electric light and water bonds to the amount of $26,500.

The Hon. George S. Hale, whose sudden death occurred recently at his cottage at Bar Harbor, Me., was the father of R. S. Hale, of Boston, who is known to many of the electrical fraternity.

The Boston Elevated Railway Company has been granted authority, by the Massachusetts Board of Railway Commissioners, to issue $10,000,000 of stock. The motive power of the road is to be electricity.

The property of the Edison Illuminating Company of St. Louis will be sold September 11, under foreclosure of the $4,000,000 six per cent mortgage, of which the Knickerbocker Trust Company of New York city is trustee.

Proposals will be received until 12 noon, August 23, by Carl Becker, City Clerk of Marietta, Ohio, for the purchase of $15,000 five per cent electric light bonds issued under provisions of an ordinance passed June 15, 1897. The city's plant is to be enlarged and improved.

PERSONAL.

Dr. F. A. C. Perrine, of Leland Stanford, Jr., University, Palo Alto, Cal., is spending a few weeks with his family at Elberon, N. J.

Mr. George A. Redman, superintendent of the Rochester, N. Y., Gas and Electric Company, visited New York city on Monday of this week.

Mr. R. N. King, of the Stilwell-Bierce & Smith-Vaile Company, Dayton, Ohio, visited New York city last week, and made his headquarters at the Waldorf.

Mr. Silas A. Barton, formerly a director of the General Electric Company, has been made the general manager of the American Watch and Tool Company, of Waltham, Mass.

Mr. Charles X. Cordier, formerly with the Bridgeport Brass Company, has accepted the New York agency of Randolph & Clowes, of Waterbury, and will make his headquarters in the Postal Telegraph Building, 253 Broadway. Mr. Cordier has a wide acquaintance in electrical circles, and his many friends will extend best wishes to him in his new field.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

FOURTEENTH GENERAL MEETING HELD AT ELIOT, ME.—THE ATTENDANCE—A REPORT OF THE PROCEEDINGS.

One of the most interesting of the general meetings held by the American Institute of Electrical Engineers was that which was held at Greenacre-on-the-Piscataqua, in the town of Eliot, Me., July 26, 27 and 28. Several recent meetings have been more largely attended, but a glance at the following list of those who were present shows that many were in attendance who rarely have an opportunity of taking part in the institute meetings. The list of those who were there follows:

THE ATTENDANCE.

Ralph W. Pope, Elizabeth, N. J.; A. E. Dolbear, Tufft's College, Mass.; T. C. Martin, New York; Chas. P. Steinmetz, American Institute of Electrical Engineers; Frederick A. C. Perrine, Leland Stanford University, Cal.; Elihu Thomson, Swampscott, Mass.; Geo. A. Hamilton, Elizabeth, N. J.; Chas. T. Rittenhouse, New York city; Fred W. Hadley, Arlington Heights, Mass.; Nelson W. Perry, L. B. Marks, W. H. Ripley, Putnam A. Bates, F. B. Crocker, New York city; Geo. A. Damon, Boston; Chas. T. Bancroft, Lowell, Mass., Douglass Burnett, New York city; Adam Bosch, Newark, N. J.; Wm. Esty, Urbana, Ill.; R. B. Owens, Lincoln, Neb.; Clayton W. Pike, Philadelphia, Pa.; W. E. Goldsborough, Lafayette, Ind.; Caryl D. Haskins and wife, Boston; W. C. Andrews, Brooklyn, N. Y.; C. L. Edgar, Chas. K. Stearns, H. C. Spaulding, Arthur E. Childs, H. W. Weller, Boston; Gano L. Dunn, New York; Geo. H. Barker and daughter, Philadelphia, Pa.; Chas. T. Childs, New York; W. S. Key and wife, Boston; R. G. Brown, Brooklyn, N. Y.; Francis Keefe, Eliot, Me.; Almor Robinson, Lewiston, Me.; W. D. Weaver, New York; J. Hally Craig, Boston; W. J. Johnston and wife, New York; Louis Bell, Boston.

The institute was welcomed by Prof. George F. Barker in behalf of Miss Sarah J. Farmer, upon whose invitation the general meeting had assembled at Greenacre. Professor Barker alluded very happily to the congenial atmosphere of the place, which made it especially appropriate that the electrical engineers should gather at the home of the late Moses G. Farmer, who entered upon his pioneer electrical work just 50 years before.

President Crocker, in replying, said that the institute had been welcomed many times, but it appeared to him that this was the first occasion when it was heartily welcome. This was due to the general spirit of hospitality which pervaded Greenacre.

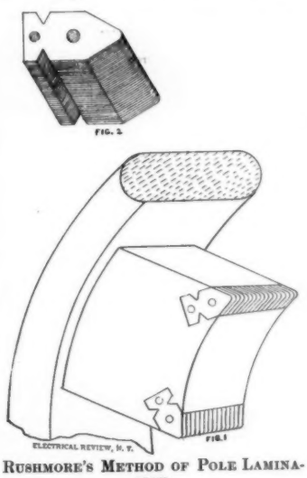
The inaugural address of President Crocker was upon the "Precision of Electrical Engineering," and dealt with the exactness with which electrical designing and engineering are now carried out. Although the profession of electrical engineering had not been recognized until recently as a legitimate division of general engineering, now, however, he claimed that neither the civil nor mechanical engineer could make their calculations with such exactness as could the electrical engineer. Papers by Chas. P. Steinmetz on "The Alternating-Current Induction Motor," and by Prof. Elihu Thomson on "A New Form of Induction Coil," were read on Monday.

Tuesday morning's session was devoted to a discussion of a paper read by Dr. Alexander Macfarlane on May 18 on the "Application of Hyperbolic Analysis to the Discharge of a Condenser." Papers were also read on the "Effect of Heat Upon Insulating Materials," by Putnam A. Bates and Walter C. Barnes, and on "The Effect of Armature Inductance upon the Electro-motive Force Curve of an Alternator," by Prof. W. E. Goldsborough. Owing to a slight delay in the proceedings, an afternoon session was held, at which Caryl D. Haskins, of Boston, presented a paper on "Electric Metering from the Station Standpoint." It was developed in the discussion, participated in by Dr. Bell and Dr. Perrine, that at present there was no entirely satisfactory method of metering which enabled the central station to secure returns for its entire capacity as required to prepare for any abnormal supply of current where induction motors were operated.

The afternoon reception on Tuesday, tendered by Miss Farmer and friends at the Greenacre Inn, was a very delightful affair. With that forethought and care for the comfort of her guests which characterizes her hospitality, and in view of the arduous duties of Secretary Pope, she had appointed for his assistance Miss Sadie Americaid, of Chicago, as private secretary. This practice proved so popular that many of the members present found themselves overworked, and had assistants provided to relieve them of the drudgery of correspondence. By diverting their minds to more congenial occupations under the guidance of these ladies—who were all familiar with life at Greenacre—the members rapidly extended their circle of acquaintances.

Each was formally presented to Miss Farmer, who was assisted in receiving by Mrs. Charles Carleton Coffin, a sister of the late Professor Farmer, and Mrs. Hammond. An elegant collation was served, which was quite a surprise to a few who were dwellers in tents, or who had little idea of the resources of rural New England in providing for welcome guests. In the evening an "Historical Sketch of the Fire Alarm Telegraph," prepared by Adam Bosch, of Newark, was read. An interesting fact in connection with Mr. Bosch's paper was that the original fire-alarm signal box designed by Professor Farmer, together with its improved successor, were on exhibition in the collection of Professor Farmer's models and apparatus.

Then followed an exceedingly important paper on "Electric Traction," being notes on the application of electric motive power to railway service, with illustrations from the practice of the Metropolitan Elevated Road of Chicago, by M. H. Gerry, Jr. In the absence of the author, who was unavoidably detained, the paper was read by the secretary and Mr. Dunn. Dr. Perrine made an interesting statement in regard to the plan of Mr. Sprague, who proposed to utilize a motor for each car, instead of confining the power to a single vehicle, in the general form of an electric locomotive or its equivalent. Dr. Perrine thought by this plan it would be possible to accelerate a train much more promptly, a very important point in elevated railroad or similar practice. Professor Thomson was of the opinion that such an arrangement of motors upon a train would lead to complications which would be found objectionable in practice, but Dr. Perrine stated that the reply to this was that on account of the number of motors the service would be free from interruption even if one or more of them were disabled.



RUSHMORE'S METHOD OF POLE LAMINATION.

At the Wednesday morning session an important paper by Horatio A. Foster was read by the secretary. The discussion was participated in by Dr. Perrine, Professor Thomson, Professor Owens and Messrs. Pope and Ripley. "Efficiency and Life of Carbons in Inclosed Arc Lamps" was the subject of a paper by W. H. Freedman, which was presented by Dr. Crocker, under whose direction the investigation was undertaken, its object being to determine the most desirable lamp for use in the new buildings of the Columbia University. The discussion was taken up by Messrs. Kennelly, Marks, Spaulding and Steinmetz.

In the afternoon Prof. R. B. Owens read his paper on "Armature Reaction in a Rotary Transformer," which was discussed at length by Professors Goldsborough and Thomson, Messrs. Steinmetz and Dunn.

The final paper of the meeting was by Prof. John P. Jackson on "The Economy and Utility of Electrical Cooking Apparatus." Professor Thomson called attention to an omission on the part of the investigator in failing to give the dimensions of the four pies which were baked at a cost of six and one-fifth cents.

An excursion to the Isles of Shoals had been arranged for Thursday, but, on account of a violent easterly storm, was abandoned.

Trolley Injunctions Vacated.

Judge Lacombe of the United States Circuit Court has signed orders vacating the injunctions which have prevented the Union Railway Company, of New York city, and the New York, Elmsford & White Plains Railway Company from using certain trolley pole devices, the patent for which was claimed by the Thomson-Houston Electric Company. Judge Lacombe bases his decision upon the decision of the United States Circuit Court of Appeals, handed down on July 21, dismissing a similar injunction in the case of the Thomson-Houston Electric Company against the Hoosick Railroad Company, on the ground that the trolley device was covered by a patent issued prior to the one claimed by the electric company.

Rushmore's Method of Pole Lamination.

In large machines, with toothed armatures, provision must be made to avoid heating, due to eddy currents set up in the pole-pieces, and with solid poles this heating is so great that it is necessary to have a large clearance, which reduces the capacity of the machine and wastes copper and energy in the field coils. Most makers to-day overcome this difficulty by making the entire poles of laminated iron, bunched together and cast solid into the field ring, and, while this method is very effective, it is very costly.

It is well known that the heating of the poles is chiefly, if not entirely, at the corners or edges; in a dynamo it is in the edges from which the teeth are being drawn, and in a motor the edges to which the teeth approach, and it therefore occurred to Mr. S. W. Rushmore that it was necessary to laminate only the corners where the heating takes place.

Fig. 1 shows the new method, with laminated sections cast into the corners of the poles. Fig. 2 shows a bunch of the iron punchings used. It will be seen that there is a great saving in labor and material over laminating the entire poles, while very few tools are required, as one size punching may be used for a number of sizes of machines.

This method, which has recently been patented, is used in all the large machines built by the Rushmore Dynamo Works, of Jersey City, N. J., and it has been found fully as effective as with entire poles laminated, and the clearance may be made as small as desired.

The plant of the electric light and power company of Grant's Pass, Ore., has been destroyed by fire. The town is left in darkness and without water. The loss is about $8,000. There was no insurance on the property.

THE RELAY AND ITS RELATION TO THE TELEGRAPHIC CIRCUIT.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, NIAGARA FALLS, JUNE 16, 1897, BY THOMAS D. LOCKWOOD.

(Continued from page 54.)

The dimensions and proportions of relay magnets have been the subject of numerous experiments in order to determine the most favorable conditions, in respect not only to the quality of maximum attractive force with a given current, which so far I have chiefly considered; but also to quickness of action, which in telegraphic apparatus is an equally important consideration. These experiments corroborate the before recited considerations, and have led to the manufacture and introduction of the standard 150-ohm relay, made, as will presently be described, as being an instrument of excellent average proportions, for the average circuit, carrying the average telegraphic current.

The electro-magnet of such a relay is composed of two soft iron cores, each two inches long and eleven-thirty-seconds of an inch thick, joined together by a soft iron yoke or heel piece two inches long, and one-quarter inch in thickness. The magnetizing coils, taken together, have a standard resistance of 150 ohms, and are composed of about 1,820 feet of No. 32 insulated copper wire, 0.009 of an inch in diameter, wound up to a spool diameter of one and one-quarter inches. This length of wire gives about 8,500 convolutions.

Such a length, of such a size of wire, fills up a spool of the stated dimensions; and the outermost layer is sufficiently near to the core to be useful.

Figuring on the attractive power of these 150-ohm relays, so constructed, we may reasonably assume the average current value of 30 milli-amperes. We multiply the 8,500 turns of No. 32 wire by the value in milli-amperes and find that we have 255,000 milli-ampere turns; or reducing, a magnetizing force of 255 ampere turns.

Suppose we have a circuit with a relay magnet of the above standard type connected therein, and that we are desirous of ascertaining whether the work of the relay may be improved by cutting down its resistance, how shall we go about it? Disregarding for the present the question of improvement in operation, we must decide which of the three ways at our disposal of reducing the resistance of a relay magnet is the best? Shall we simply wind the spools with a much smaller amount of the standard length of the standard size of wire? Shall we wind it with wire much larger, so that the lesser amount required to fill the spool will have a resistance reduced as required? Or shall we connect the two standard relay spools wound with the standard wire and length in parallel, and thus bring it down?

The first plan is so obviously bad that we may discard it at once; since by it we should leave a large portion of the effective space round the core unutilized, and lose much magnetizing power. The second is a much better way, but even it is not as economical as the third, which counteracts in a great measure the back electro-motive force due to the reaction of the cores as they gain and part with magnetism.

The question of operation improvement is now to be settled. We have seen that 8,500 turns with a 30-milli-ampere current gives us a magnetizing power of 255 ampere turns; but being ordinary mortals, we are not content. "Man never is, but always to be blest." Accordingly we think that fewer turns of a larger wire may give us better results, because it reduces the resistance; or that perhaps it will for the same reason be a good thing to join up the spools of the relay in parallel.

Now, we may reason this way: If it be a fact that reducing the resistance of a relay magnet gives us better results, the more we reduce it the better our results must certainly be. Why not?

Fortunately, it is not a difficult thing to try. We certainly can not go lower than a single convolution round each core; so we choose an insulated copper wire so big as to fill the entire space on the spool intended for the coil, and pass it once round each core. It has, of course, practically no resistance. Unfortunately, if the current in the circuit be still but 30 milli-amperes, the magnetizing power with but one turn has a value of only 30 milli-ampere turns, which amounts to nothing, and, as a matter of fact, with such a winding to make our relay as effective as before, we should require a current in the circuit of no less than 255 amperes, which, having a capability of warming up a good size copper rod—and for many other reasons as well—is clearly out of the question.

Evidently, if it be advantageous to reduce the relay resistance, we must stop short of such extreme measures. Let us then try a relay of 50 ohms resistance, still assuming the average working current of 30.

We make a good 50-ohm relay by using the same cores as before, winding them, however, with 4,000 turns of No. 27 wire. But when we multiply, we find that instead of the 255 ampere turns we have in the standard relay, we obtain with this one but 120 ampere turns. Certainly, so far as magnetizing power goes, we have made a change for the worse.

But to come to a case which has already been before us, viz., the Milwaukee and Oskosh circuit, mentioned last year by Mr. Fry, we note that the resistance of the relays of this line averaged 150 ohms each, that the total resistance of the circuit was 6,810 ohms, and that the battery was one of 150 cells. If these were blue vitriol cells, there would be an electro-motive force of about 150 volts; and, dividing these 150 volts by the 6,810 ohms, the normal current of the undoctored line was 22 milli-amperes only.

The current here, to begin with, was lower than it ought to have been. We are informed that, when all of the relays were altered by joining their spools in parallel, the battery was reduced to 75 cells, the resistance having been reduced to 3,938 ohms. But this step—still supposing blue vitriol cells—brought the current down to 19 milli-amperes, so that the ampere turns acting on each relay were reduced in two ways—first, by having them between the two relay spools in parallel; and, second, by cutting down the main line current.

For, under the original conditions, each relay would have a magnetizing power of 187 ampere turns, while after the alteration each could only have a magnetizing power of 40½ ampere turns, since the disposable power of 81 ampere turns, which otherwise could be attained from the reduced battery, is halved by connecting the spools in multiple.

It must be distinctly understood that I do not at all doubt that the improvement reported by Mr. Fry took place; but I should expect that there were some conditions in the case of which we are not informed. Unquestionably, the paralleling of the coils acted advantageously in another way, to which I must presently advert; and it is not improbable that in a circuit of so many stations, the particular evil of the inductive discharge was really the disturbing agency. The matter of the relation of other lines supplied by the same battery is also one to be considered.

I am with Mr. Fry as far as the change in his spools go; in that I can conceive of conditions where improvement would follow such change; but I think it would have been better to leave the battery unreduced; for while it is true that by reducing the battery power we do, indeed, decrease insulator leakage, it is also true that we, in the same proportion, decrease working current. Whatever the battery power, the current is bound to divide between the line and insulators directly as their respective conductivities.

So far, however, we have devoted more consideration to the relay and current than we have to a full fledged telegraphic circuit with a large number of relays connected in it at as many stations. But, after all, it is only in its relation to the circuit that the study of the relay becomes of great importance. Hence we can not neglect the study of such relation.

For, in such circuit, not only is the magnetizing power and quickness of action of each particular relay acting as a receiver to be considered, but we must likewise consider the relays as a whole, in their condition as a part of the circuit through which the current designed to actuate each particular one has to flow; and realize that each and every relay at each closure of the circuit develops in its coils, and consequently in the main circuit, an inductive impulse of current having a direction opposed to that of the main current; and at each opening of the circuit a similar impulse of current in the same direction as that of the main current.

The effect of this is to make the relays slower than they ought to be in attracting their armatures, and slower than they ought to be in allowing the springs to retract them. It is this effect which is acting when an operator, while sending, experiences a sensation as though his key was working with difficulty, and as though, in consequence, he can not make the signals as clear and fast as he knows he is able to on an easy circuit.

All that has been said concerning the reduction of relay resistance per se, and the necessity of ampere turns, applies with even greater force to relays on a well loaded circuit than they do to a shorter circuit, or one which has but few relays.

The substance of the ideas indicated is as follows: In the electro-magnets of relays the effect of a current is multiplied by the number of turns of wire in the coil. It is lessened by an increase in the distance between the wire and the core, each layer acting less powerfully than the one beneath it. The current itself is enfeebled by each addition to the length of the coil, because of its increased resistance; and this is more felt when the coil is placed on a short circuit than when the line conductor has itself considerable resistance; because, in the first case, a slight addition to the resistance of the coil bears a large proportion to the total resistance of the circuit, while in the latter case the proportion is but small. None of us, for example, would wind a sounder spool in a local circuit up to 150 ohms, for the very apparent reason that such a resistance would unduly weaken the current furnished by a small local battery, as well as for another very important reason, that fine, silk-covered copper wire costs much more than coarse wire. These facts are made very clear by placing the coils of a relay in a local sounder circuit without taking the sounder out.

What follows? Why, that the sounder magnet will not work, while the relay magnet will work with considerable force. There was once a popular repeater—that of Burnell, I think—which worked on this principle, and the old-fashioned way of explaining it was to say, "When a current of low intensity passes through two magnets differing considerably in resistance, the attraction of the magnet having the least resistance is very small in comparison with that of the other."

But, as we now know, the real state of affairs is much simpler, and is just this: that the high resistance of the relay winding reduces the strength of the local current so much that it can no longer excite sufficient magnetizing power in the few turns of the coarse winding of the sounder, while the many turns of the relay make the most of such current as is left, and are, therefore, still able of doing their work.

When a line wire is very long, the current will necessarily be feeble; and the coil should consist of a great length of fine wire, which occupies little space and allows very many layers to be wound on without increasing the distance from the core too much, while its resistance bears too small a proportion to that of the rest of the circuit to reduce the strength of the current materially.

(To be concluded.)

Telegraphers and the Yellow Fever.

Every announcement of the arrival of a vessel at an American port with cases of yellow fever on board sends a thrill through the telegraph operators of the country, especially those employed in eastern cities, says the *Telegraph Age*. In 1878, when the "saffron scourge" was almost depopulating the cities of the South, many southern operators died, and, as the mails were quarantined, there was a possibility for a time that all communications between North and South would be shut off. Although the Western Union company did not ask for volunteers among northern operators to go South to keep communication open, several men offered their services. Four were employed in Pittsburgh, two in Philadelphia and one in Boston. The four Pittsburgh men went to Memphis, and all died of the fever within a few days after their arrival. The Boston man started for New Orleans, and accidentally shot himself in a New York hotel. One of the Philadelphians, on his way South, was arrested and sent to jail in St. Louis on a trumped-up charge preferred by his mother, who took that means of preventing her son from risking his life. The seventh volunteer, also from Philadelphia, reached New Orleans safely, was not ill a day, and was the only one that reached the yellow fever country that year and returned alive. Several vessels with fever on board have arrived in New York recently, but the quarantine system is so perfect now that the danger of a spread of the disease has been reduced to a minimum.

ELECTRIC LIGHT FLASHES.

The Capital Gas and Electric Light Company, of Frankfort, Ky., has declared a two per cent dividend for the past six months.

Lansdale, Pa., proposes to increase its debt $20,000 for procuring an electric light plant, and council has ordered a vote in November.

The Cambridge, Mass., Electric Light Company has declared its 15th regular semi-annual dividend of three per cent, payable August 2 to stockholders of record July 26.

A proposal to light the entire city of Chicago with electricity, generated by a mammoth plant situated at Joliet, and operated by a water-power equivalent to 80,000 horse-power, has been made informally to Mayor Harrison by the trustees of the sanitary district.

The waterworks and electric light company, of Billings, Mont., has just placed an order for a new dynamo of the very latest pattern, which they will have in position by September 1. It has a capacity of 2,000 lights, just double that of the present dynamo, and is also adapted to furnish power pressure, so both the light and water service will be materially improved when it is in use.

The Dolgeville Electric Light and Power Company, of Dolgeville, N. Y., have contracted with the Westinghouse Electric and Manufacturing Company, through the latter's Syracuse agency, for two 450-kilowatt two-phase alternating-current generators, one 250-kilowatt rotary transformer, exciters and a large marble switchboard, together with a number of transformers for light and motor work. The generators will be connected direct to Victor turbines running at 300 revolutions per minute, under 72-inch head. The rotary transformer will deliver direct current at 600 volts for present direct-current motor service in use in various manufacturing establishments. Both light and power will be furnished. The alternating-current generators are of 7,200 alternations.

The second hearing in the case of the Patchogue, L. I., Electric Light Company against the Patchogue Lace Manufacturing Company, for $10,000 damages for alleged taking of more than their share of water, came before Supreme Court Justice Wilmot M. Smith, at a special term a few days ago. W. H. Jayne, an expert hydraulic engineer, of New York, was the chief witness, and he was on the stand nearly all day. Edward H. Terry, former owner of the pond, was the only other witness. Both witnesses were for the plaintiffs. T. M. Griffing appeared for the plaintiffs, and Leopold Wallach, of Wallach & Cook, of New York, appeared for the defendants. The case was adjourned until September 15. The plaintiffs charge the defendants with drawing off too much water in the Patchogue mill-pond, owned jointly by the two companies, each being apportioned one-half of the water for their respective factories.

News From Chicago.

Mr. Jacob Cloos, manufacturer of the well known high-potential junction box, spent a few days in Chicago last week looking after some large orders.

The Englewood & Chicago Electric Railway Company was ordered to be sold, by Judge Showalter, on the 27th ult. The degree provides that out of the purchase price shall be paid, first, the cost of administration, and then series "F" of receivers certificates, amounting to $60,000; then series "B," amounting to $260,000, and thereafter the bonds. The plans for the organization of the new company have already been agreed upon.

Mr. W. H. McKinlock, president of the Metropolitan Electric Company, Chicago, and the American Exchange National Bank obtained judgments against the Metropolitan Electric Company on the 27th inst., the amounts being $27,723 and $7,050, respectively, the company confessing judgment. The store was at once taken possession of by the sheriff and the doors closed. The value of stock and fixtures is estimated at $60,000, the book accounts being valued at $40,000. An assignment followed in the County Court, the Chicago Title and Trust Company being named as assignee. The Metropolitan Electric Company was organized in 1892, with a capital stock of $300,000; President W. H. McKinlock and his brother, Walter C., being the largest stockholders. For some years the company did a good supply business, being considered as one of the representative supply houses of the country. Of late, however, the company suffered greatly by the depression of business, and owing to slow collections found it advisable to wind up the business in the manner stated.

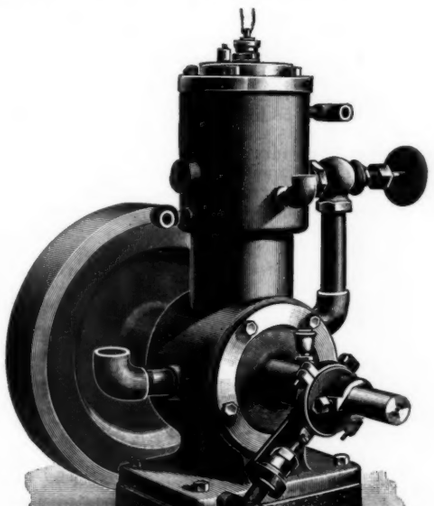
Chicago, July 29. C. E. K.

The General Electric Company, of New York, has brought suit in the United States Circuit Court against William Grant and J. J. Crooks to recover $12,250, the value of an electric plant furnished them near Columbia, Tuolumne County, Cal.

Palmer Brothers' New Gas Engine.

In the accompanying illustration is shown a new vertical gas and gasoline engine, recently brought out by Palmer Brothers, Mianus, Ct., with a view to furnish the complete engine or castings, with working drawings for amateurs and others desiring to construct an engine. It is suitable for running light machinery when arranged as a stationary engine. The marine type (which is shown in the cut) will run a 16 or 18-foot boat or light motor carriage. It will run in either direction.

A pump is used to circulate water in the water-jacket of the portable engine. In the stationary form a tank is used instead of a pump. These motors are built on the two-cycle compression system, with an impulse at each revolution of the crank. It receives its charge and exhausts through a cylinder port opened and closed by the movement of the piston. A suitable valve regulates the charge received from the closed crank chamber, in which the mixture is compressed by the downward stroke of the piston. Vapor and air are drawn into the crank-case by the upward stroke of the piston, and thoroughly mixed by the motion of the crank. The engraving shows the circulating pump, but the pipe leading from the pump to the water-jacket is omitted.



PALMER BROTHERS' GAS ENGINE.

The weight of the marine engine is 135 pounds; of the stationary, 200 pounds. The height of the stationary engine is 23 inches, and that of the marine is 17 inches. The height from the base to the center of the shaft is four and one-half inches.

Col. Frank Schefold, formerly superintendent of the waterworks company of New Albany, Ind., is endeavoring to induce the citizens of Orleans, Orange County, to construct an electric light plant and a system of waterworks. He proposes to furnish a plant sufficient to operate a waterworks system and 1,000 incandescent lamps for $15,000. This would include three miles of water mains and 25 fire plugs.

The International Association of Fire and Police Telegraph Superintendents.

President Frank C. Mason, of Brooklyn, N. Y., has sent out a circular relating to the annual meeting of this association. It is to be held at Nashville, Tenn., September 14 and 15, with headquarters at the Maxwell House. The "Old Time Telegraphers" and the United States Military Telegraph Corps meet in Nashville at the same time.

Capt. Wm. Brophy, chief electrician of the wiring department of the city of Boston, will read a paper on "Modern Construction and Maintenance of Wires for Municipalities."

Mr. J. W. Aydon, superintendent of Fire and Police Telegraph, Wilmington, Del., will read a paper on "Storage Batteries and Switchboards as Applied to Fire and Police Telegraph Systems."

Several others have agreed to prepare papers for the occasion, but have not yet announced the subjects.

President Mason is in receipt of many letters relating to the Nashville meeting. Supt. E. F. Schurig, of Omaha, has, with true western enterprise, written an appeal for his city as the next place of meeting.

Captain Brophy has written as follows concerning the association:

"A great deal depends on the outcome of the next meeting, for if it proves to be what it should be, as you say, its future is assured. I feel now, and have for a great while, that city and town authorities do not realize the importance of the fire and police signal systems or their superintendents.

"The position of superintendent of either system must be a man of intelligence, be competent in every branch of his business, honest and fearless. The faithful, competent superintendent should be as secure in his position as the rock of Gibraltar, and never be removed, no matter how often changes may take place in the administration."

Hudson River Power Transmission Company.

The Hudson River Power Transmission Company has been incorporated, with a capital stock of $750,000. The company will construct and maintain a dam in the Hudson River between the towns of Halfmoon and Schaghticoke at the base of Heron or "Quack" island, about two miles south of Mechanicville, for the purpose of generating power, electrical and otherwise, and transmitting it to points in Albany, Rensselaer, Saratoga, Washington and other counties in New York State. The company is to have a corporate life of 50 years and its first directors are R. N. King, Dayton, Ohio; F. V. Greene, New York; George S. Field and Edmund Hayse, of Buffalo, and Gilbert M. Furman, of Binghamton.

A Secret of Success.

"One of the great secrets of success, I believe, is to first have a good thing and then to advertise it so that the people can not help knowing that you have it."—ROBERT BONNER.

THE METERS OF TO-DAY.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, LA CROSSE, JULY 21, BY R. F. SCHUCHARDT.

The importance of the meter question has long been recognized by central station men. The advisability of the sale of electricity by meter is no longer disputed. A good meter is always superior to the best contract. For the station manager the meter will give a good basis from which to estimate the schedule price, instead of making him guess at it; the ratio of income to cost of operation will be more fixed; there is less unnecessary burning, so the life of the lamps is considerably increased. The customer can regulate his light bill, and there will be square dealing on both sides. But to attain the above advantages, the meter must be at least fairly accurate. It is the intention of this paper to describe the condition of the commercial meters we are now using.

Since 1872, when the first meter was patented in this country, much mechanical ingenuity and skill have been expended in designing and perfecting this apparatus, and well known electrical engineers are still struggling with the subject, aiming at the production of a cheap, and, at the same time, a very accurate and serviceable instrument.

There are three classes of meters—the electrolytic, clock and motor meters. In the first, the quantity of current is measured by the amount of metal deposited, or the quantity of electrolyte decomposed in an electrolytic cell. The only one of this class which has found much use in America is the Edison chemical meter, which, though exceedingly accurate under proper conditions, has the decided disadvantage of having no recording device, and, like all electrolytic meters, is likely to freeze unless heat is provided, which entails a loss.

Most of the clock meters consist of two clocks, one of which keeps accurate time, the other being retarded or accelerated by the action of the current on its pendulum. This retardation or acceleration is registered by a differential gear connecting the two clock works, which, in turn, operates a train of gears connected to the dial. The objection to most of these is that the clock must be wound up every month or so, which, if neglected, will cause the meter to run backwards and destroy all former readings. Of this class the Aron is the most successful, being constructed for both direct and alternating currents. It is, however, little used in America to-day.

The most important class comprises those meters which operate on the principle of the electric motor. The American meters of this class are the Thomson, of the General Electric Company; the Duncan, of the Fort Wayne corporation; the Shallenberger, of the Westinghouse company, and the Scheeffer, of the Diamond Electric Company. The Thomson is built to operate on both direct and alternating currents, and consists of a simple motor with no iron in armature or field. All of the others are induction motors.

The ideal meter should be a watt meter, as amperes do not represent the true consumption of energy, especially on an inductive load.

It should be direct reading and have a constant of unity.

It should start immediately with the smallest load, and be equally correct on all loads.

The meter should absorb no energy, nor should there be any drop of pressure through it.

It should be simple, both in construction and operation, and mechanically correct, so it can be easily installed and looked after, and it should not deteriorate in service.

It should be designed to operate with a slow speed.

The case should have a glass or mica window, so that the meter can be readily calibrated while in service, and it should be easily sealed.

Above all, it should be cheap, without sacrificing any of the above conditions.

Mr. George H. Jones, of Fond du Lac, and myself have just completed a thesis on American electricity meters under Prof. D. C. Jackson at the University of Wisconsin, and I have drawn largely from our thesis for this paper. The results obtained in our investigations show that the meters of the present day are not all that might be desired, and you central station men, who know that the bills of customers using approximately equal amounts of light often vary to a great extent, and who continually have complaints of overcharges made to your companies, will bear me out in this. It is of the utmost importance that central station men test each meter they install. Many managers are beginning to realize the importance of this subject, and have added meter-testing departments to their stations, where all meters are tested before they are installed. After they are once installed, they should be inspected every six months or so in order to see that they are working properly. This is hardly ever done at present.

I have with me a few curves, showing the accuracy of some of the meters tested by us. They illustrate very clearly the action of these meters. Our method of calculating the error of the meter may be of interest. The speed of the meter is directly proportional to the load; therefore, for a given load, the product of seconds per revolution of the armature and amperes, in ampere-hour meters, or watts for watt-hour meters, equals a constant (which we call K), which varies with the make and size of meter. As will be seen, this K is the time, in seconds, which it takes for the armature to make one complete revolution per unit of load—ampere or watt.

The product of the observed load and seconds per revolution divided by this K, $\frac{\text{amp.} \times \text{sec.}}{K}$ or $\frac{\text{watts} \times \text{sec.}}{K}$, should then equal unity for an accurate meter, and the variation from unity will give directly the error. Should this quotient be more than unity, the meter runs too slowly on that load; and if less than unity, the error will be negative, which means that the meter is running too fast. Thus, let the time per revolution be four seconds for a load of 440 watts on a 10-ampere 100-volt Thomson wattmeter. The value of K for this meter is 1,800; then $\frac{4 \times 440}{1{,}800} = .978$, which shows that the meter runs 2.2 per cent too fast on that load; or, let the time per revolution of the armature be two seconds for 3.3 amperes on a 20-ampere Shallenberger ampere-hour meter in which the value of K is 6.33; then $\frac{2 \times 3.3}{6.33} = 1.042$. The meter is therefore 4 2 per cent slow on that load.

The curves show that the action of the meters is very irregular, but their general behavior is clearly shown.

We found our samples of the Duncan watt-hour meters to run too fast, but, by properly adjusting the magnets, their error could be brought within the limits of about five per cent either side. Both of the Duncan ampere-hour meters tested started much too slowly and were also much too slow on the high loads. The effect of frequency is very marked, the difference in error at full load between frequencies of 60 and 130 being about 30 per cent.

After starting load, the Scheeffer wattmeter ran with a small and fairly uniform error. These meters are designed for frequencies, and, when built for two frequencies, are provided with a special German silver resistance in the pressure circuit to compensate for the difference. One of the meters tested by us, built for frequencies of 60 and 130, ran with an average difference of about 6 per cent between these frequencies.

All of the new Thomson wattmeters started on no load, while the old ones started much too slowly. Their curve of error is a remarkably straight line after starting load. They are, of course, independent of frequency.

The Shallenberger ampere-hour meters started much too slowly. One of the three tested ran fairly uniform after starting, while the other two were too slow on high loads. The higher frequency makes them run from five to fifteen per cent faster.

The Shallenberger watt-hour meter was found to be very fair. It started on a very light load, ran without any great error, and responded promptly to changes of load. Frequency has no appreciable effect.

All of the meters tested are practically unaffected by the changes of pressure likely to occur in service. The Diamond wattmeter should not be used with inductive load, as the effect of such load is very marked, making the meter run much too slowly, and with a power factor low enough it stops entirely and even runs backwards.

Besides these meters tested in the laboratory we were enabled, through the courtesy of the Madison Gas and Electric Company, to test meters in actual service. The general results of this test indicate that the ampere-hour meters require a comparatively large current to start them; run much too slowly on starting load and on the higher loads. Most all of them have considerable error on overloads. The wattmeters are somewhat better, and, as a rule, run too fast on all loads except at starting and with a fairly uniform error. The Thomson meters show the least variation in error, but the continuous watts absorbed are more than in any of the others.

A fact of great importance brought out in this test is the lack of proper attention paid to the installation of the meter. In many cases the meters are placed on door frames where they are continually jarred. They should be installed by securely fastening them to a firm wall in a readily accessible dry place and well leveled. The meters should all be carefully sealed, to prevent being tampered with. The seal should bear the private mark of the company, so any unauthorized inspection of the meter can be detected. The meter is a delicate piece of apparatus, and should be carefully handled when being placed in position, so as not to injure it.

After it is installed it should be tested, to be sure it is running correctly. Spiders and insects in general are very fond of the warm meters, and have many times helped to reduce the consumer's bill. The meter should, therefore, be dust-proof and be regularly inspected.

In choosing a meter the following points should be considered:

1. Accuracy. 2. Registration. 3. Power absorbed. 4. Direct reading. 5. Attention. 6. Mechanical construction and durability. 7. Cost—initial and continuous.

1 and 2. The meter should be accurate within at least five per cent, either way, on all loads for which it is designed, and should begin to register on, at most, one per cent of its full load.

3. The power absorbed should not exceed two watts per 10 amperes capacity of wattmeter, nor should the full load drop through the meter be larger than .5 volt.

4. The reading should be direct and not have to be multiplied by a constant. The multiplier means extra work for the clerk, and offers a chance for an error, both in the calculation and in the possible omission.

5. There should be no electrical contact-makers, which rapidly deteriorate, and the meter should require no attention.

6. Delicate mechanisms should be avoided. The meter should not be liable to wear out nor get out of order readily. The cover should be dust-proof and capable of being easily sealed.

7. Last, but not least, comes the cost of meters. This is not only the amount paid for the meter, but includes the cost of energy continuously absorbed.

Take a meter costing $10 and absorbing 10 watts continuously. With interest at six per cent, energy at four cents per kilowatt hour and 10 per cent for depreciation (which probably is a low value for a cheap meter), the annual cost of the meter to the central station is $5.10.

A meter absorbing two watts at the same rates as above would cost $3.90 per year. At the end of 10 years the first meter will have cost $61, while the $20 meter will have cost but $59, and it ought still to be in good condition at that time. The higher-priced meter is likely to be the more accurate of the two.

With a meter per customer, this question of cost is a very important one to the central station manager.

There are several ways in which a meter can be tested. In some methods the load is computed from the time per revolution of the armature and the true load found on an indicating instrument. We think that a "per cent error" states the condition more clearly than any method which finds the error in amperes or watts for the different loads. We also think our stop-watch method the most satisfactory. It takes much less time, and therefore less power, than the five-hour full-load test used in some methods. For a satisfactory test the starting load should be found, and also the time per revolution taken with a stop-watch, the accuracy of which can be relied upon at starting one-fourth, one-half, three-fourths, one and one and one-fourth loads. Any number of ammeters can be connected in series and tested at the same time. With the aid of a slide-rule the per cent error can be figured while the meter is coming up to speed on the next load.

I have here a design of a meter-testing rack, built by Mr. Jas. E. Judd and myself, for the Madison Gas and Electric Company.

THE VAN DEPOELE TROLLEY DECISION.

MR. BENJAMIN BELIEVES THE GENERAL ELECTRIC COMPANY STILL CONTROLS THE "SO-CALLED TROLLEY INVENTION."

TO THE EDITOR OF ELECTRICAL REVIEW:

The recent decision of the United States Circuit Court of Appeals for the Second Circuit, in case of the Thomson-Houston Electric Company vs. Hoosick Railway Company, in which letters patent No. 495,443, granted April 11, 1893, to the administrators of Charles J. Van Depoele for "traveling contact for electric railways" was involved, has created widespread interest, and I believe has been generally misunderstood.

The technical press, in commenting upon this decision, has assumed that its effect is to destroy the monopoly of the General Electric Company in the invention commonly known as the "trolley," or, otherwise, "an upwardly pressed trailing arm carrying on one end a contact device adapted to engage the under side of a suspended conductor." This assumption or conclusion, in my opinion, is erroneous.

In order to comprehend the opinion just handed down, it is necessary to bear in mind that patent 495,443, as well as patent 424,695, had previously been before the same court in an action in which patent 424,695 was involved (Thomson-Houston Electric Company vs. Elmira & H. Railway Company, 71 F. R. 396), and that in the opinion handed down in that case, and which was written by the same judge (Judge Wallace) it was held that certain claims which related to the trolley showed patentable invention.

In that case, and in referring to certain prior patents of the same inventor which were alleged to show the same invention, the court said:

"The principles of law applicable to the case may be briefly stated. An inventor, in describing an invention in a patent granted to him, does not necessarily preclude himself from patenting it subsequently. His omission to claim what he describes may operate as a disclaimer or an abandonment of the matter not claimed; but it has no such effect when it *appears that the matter thus described, but not claimed*, was the subject of a pending application in the Patent Office by him for another patent. This was explicitly adjudged in Suffolk County vs. Hayden, 3d Wallace, 315, and recognized as sound doctrine in the Barbed Wire Case, 143, U. S., 275. The invention secured by a patent is that which is secured to the patentee by the claim. The claim is a statutory requirement prescribed for the purpose of making a patentee define what his intention is so distinctly and exactly as to apprise other inventors and the public what is withdrawn from general use. The claim, however, is to be read in the light of the description contained in the specification, and its literal terms *may be enlarged or narrowed accordingly*, but not to an extent inconsistent with their meaning.

"Identity of language in the claims of two patents does not necessarily import that the invention patented by each is identical, nor does a difference in phraseology necessarily import that they are for different inventions. The test of identity is whether both, when properly construed in the light of the description, *define essentially the same thing*. When the claims of both cover and control essentially the same subject matter, *both are for the same invention*, and the later patent is void."

Turning now to the language used in the present case, the court said:

"It is manifest that both patents are intended to and do, secure to the patentee *the same general inventions* as are comprised in the combination of suspended conductor and contact devices, and the combination of suspended conductor, contact device and switching devices, although the earlier patent also covers the improvement in the switches and subordinate combinations between these devices and the elements of the principle combination. But we are of the opinion that Claim 15 of the earlier patent describes and embraces everything of substance which is covered by Claim 7 of the patent in suit."

Patent 424,695, *Claim* 15:

In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, a contact carrying arm pivotally supported on top of the car and provided at its outer end with a contact roller engaging the underside of the suspended conductor, and a weighted spring at or near the inner end of the arm for maintaining said upward contact, substantially as described.

Patent 495,443, *Claim* 7:

In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, a swinging arm supported on top of the car, a contact device carried by one extremity of the arm and held thereby in contact with the underside of the electric conductor, and a tension device at or near the other end of the swinging arm for maintaining said upper contact, substantially as described.

In referring to Claim 15, the court said:

"Claim 15 specifies a combination, the elements of which are the car (implied necessarily and needlessly mentioned), the suspended conductor and the contact device. The element termed 'a contact-carrying arm, pivotally supported on the top of the car, and provided at its outer end with a contact roller engaging the underside of the suspended conductor,' exactly defines all the essential features of the contact device described in each specification, except the tension device. It must be hinged as well as pivoted, otherwise the tension device will be inoperative to maintain upward pressure. The element termed 'a weighted spring' is the complete tension device described in both specifications, and, which as described, necessarily exercises the two-fold function of maintaining upward contact between the contact device and the suspended conductor, and of maintaining the pivoted arm in its central or normal position. The 'tension device' of Claim 7 is the whole device described in the earlier patent as the 'weighted spring' of Claim 15."

This last qualification as to Claim 15 was probably inserted by the court in view of its statement in the former case, to wit:

"It is the function of the weight to hold the spring down and to give to the contact wheel a greater range of action. The claims are too explicit to be altered or enlarged by the omission of the weight; the spring itself could, as reasonably, be eliminated as the weight."

The court further said:

"We are also of the opinion that Claim 33 of the earlier patent specifies essentially the same combination embraced in Claims 8, 12 and 16, of the patent in suit, and that the 'spring,' or 'weight,' of Claim 33 is the same thing as the 'tension springs' of Claims 8, 12 and 16, the weight being only an alternative element. It would be a waste of time to dwell upon the verbal differences in these claims. The changes in phraseology impart nothing of *substance* into their respective combinations. They describe the same thing in different language."

Patent 424,695, Claim 33:

In an electric railway, the combination with an overhead conductor and a vehicle of an intermediate contact device, consisting of an upwardly pressed trailing arm, having a grooved contact wheel at its outer end by which it is guided by the conductor, the said arm being free to swing laterally relatively to the vehicle, but tending to remain in its normal central position by means of a spring or weight.

Patent 495,443, Claims 8, 12 and 16:

8. In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, an arm pivotally supported on top of the car and provided at its outer end with a contact engaging the under side of the suspended conductor, and a tension spring at or near the inner end of the arm for maintaining said upward pressure contact, substantially as described.

12. In an electric railway, the combination of a car, of a post extending upward therefrom and carrying a suitable bearing, an arm or lever carrying at its outer end a suitable contact roller and pivotally supported in said bearing, and provided at its inner end with a tension spring for pressing the outer end of the lever carrying the contact wheel upward against a suitable suspended conductor, substantially as described.

16. In an electric railway, the combination of a car, a conductor suspended above the line of travel of the car, an arm pivotally supported on top of the car and provided at its outer end with a grooved contact wheel engaging the under side of the suspended conductor, and a tension spring for maintaining an upward pressure contact with the conductor, substantially as described.

Brushing away the cobwebs of technicalities of expression, etc., the language used apparently means that the court is of the opinion that Claims 15 and 33 of Patent No. 424,695 have the same breadth and are for the same invention as Claims 7, 8, 12 and 16 of Patent No. 495,443.

In still other words, the court practically says that although Claims 15 and 33 are not in as broad terms as Claims 7, 8, 12 and 16 of the last patent, yet they are not to be construed literally; that in point of fact there was no disclaimer or abandonment of the actual invention (the actual invention being the subject of another pending application in the Patent Office).

It may be argued that the disclaimer contained in Patent 424,695—to wit: "While I did not intend to claim generally in this application a contact device of this construction," i. e., a spring-pressed contact device—acts as an estoppel, and does not permit of a broad interpretation of the claims. But as to this point the court in the present case says:

"But we are of the opinion that although the earlier patent contains matter of disclaimer inserted for the purpose of making the later patent ostensibly the generic one so far as it related to the contact device, such matter is antagonized by and is wholly inconsistent with some of the claims."

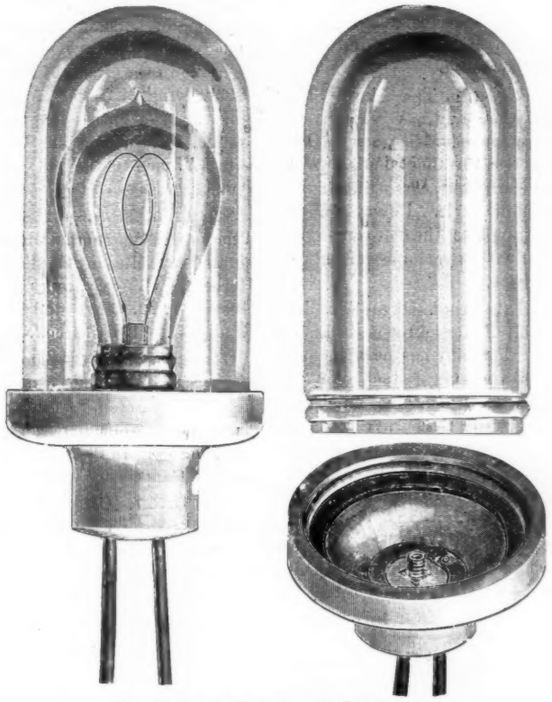
Or, in other words, the court says, the claims control. You may interpret the claims by the specification, but you may also neglect anything in the specification which is antagonistic to the claims.

Without going further into details, and having in mind all of the equities of the case, the opinion of the court, I think, is susceptible of being read as follows:

The claims in suit of patent No. 495,443, are void, because the same inventor has another patent, prior in date, containing claims of practically the same breadth and scope. There can not be two valid patents for the same invention. Assuming that it was the intention of the court to neglect the disclaimer contained in patent No. 424,695, and consider the limitations which the inventor inserted in the claims of that patent, as mere vagaries of expression, and not as express limitations required by the state of the art, the practical effect, so far as the general public is concerned, is that claims 15 and 33 of patent 424,695 are *prima facie* valid and the General Electric Company still controls the so-called "trolley" invention. Respectfully,

GEO. H. BENJAMIN.

New York, July 30.



THE NEWGARD WATERPROOF RECEPTACLE.

The Newgard Waterproof Receptacle.

This is a combination of waterproof socket and waterproof globe complete in one appliance. As will be seen from the accompanying illustration, a single piece of porcelain forms a socket, or receptacle, for the lamp and the cover for the globe. The conducting wires are permanently sealed in this porcelain cap, which is threaded into the receptacle, and the glass globe and rubber gasket in the cover make a water-tight fitting between the cover and the globe, making an outfit which can be used under water with perfect safety.

The Newgard waterproof receptacle finds its largest field of usefulness in breweries, packing houses and similar work where it is customary to wash the floors, walls and ceilings with showers of water. It will also be found to be a perfect solution of the difficulty in all places where severe conditions have heretofore made a perfect insulation of lamp and socket an impossibility, such as cold storage warehouses, paper mills, etc.

The receptacle is made regularly with T.-H. base, but can be used with the Edison lamp by the use of a T.-H. adapter. The globe will take either a 16 or 32 candle-power lamp, the opening in the globe being two and three-fourths inches. The length of the globe is six inches, while seven inches is the length of the outfit over all.

Although just introduced, several hundred of these outfits have already been placed in a number of Chicago breweries, and the results secured have been most satisfactory. The Newgard water-proof receptacle promises to come into very extensive use. The Electric Appliance Company, of Chicago, will be glad to give further information on this specialty.

Fire in the Excelsior Electric Company's Factory.

A fire broke out early one morning last week in the factory of the Excelsior Electric Company, of Brooklyn, N. Y., and destroyed several thousand dollars worth of apparatus and stock on hand. The water of the fire department added to the damage considerably. The loss was fully covered by insurance, and President H. D. Fuller, of the company, expects to have everything running in good shape this week. The total loss is estimated at about $25,000.

ADVANCE INFORMATION

Electric Light and Power.

CHICAGO, ILL.—Philadelphia capitalists plan for street railway consolidation. They have just effected a reorganization of the Englewood & Chicago Electric Street Railway Company, having largely increased the capitalization of the latter.

BENTON HARBOR, MICH. — The Benton Harbor & Eastern Railway Company; injunction served on officers has been dissolved, and the road will be pushed to completion.

STAUNTON, VA.—A movement is on foot to build an electric railroad from Staunton to Monterey.

ALEXANDRIA, VA.—The Washington, Arlington & Falls Church Electric Railway Company are making surveys to extend the road from Arlington, in a southwesterly direction, across Alexandria County to the Theological Seminary, in Fairfax County.

JANESVILLE, WIS.—The Janesville Electric Light and Power Company has been organized, with a capital stock of $25,000. The officers of the company are: President, Charles B. Conrad; secretary and treasurer, Charles F. Lowing, Chicago; directors, C. B. Conrad, E. F. Carpenter and R. R. Lane. Work will begin on the construction of the plant immediately, and it will be in operation by August 15. The company will furnish inside lighting for stores and private residences.

ALMA, MICH.—Preparations have been completed for lighting this town by electricity, and the work has been begun on the new 350-horse-power plant. There will be 16 arc lights to start with, and as many private lights as desired. The same company will operate the city waterworks, which will be run on the meter system.

EDINBURG, ILL.—Tipton & Burnett, of Girard, have been granted a 10-year franchise for an electric light system. The plant will be in running order within 90 days.

STEVENS POINT, WIS.—The City Council has entered into a six-year contract with the Stevens Point Lighting Company, to furnish its street lights at the rate of $650 per month for each 2,000-candle-power light.

CLAYTON, DEL.—The light and water plant of St. Joseph's Industrial School at this place are now in operation.

VALLEY CITY, N. D.—The contract for installing a municipal electric light plant here has been awarded to the Electric Machinery Company, of Minneapolis.

PHILADELPHIA, PA. — The new plant of the Lancaster Electric Light Company, at Slackwater, on the Susquehanna River, has been put in operation.

PRAIRIE DEPOT, OHIO—A franchise to erect and operate an electric light plant here for street and commercial lighting has been awarded to Mr. Owen King, of Bowling Green, for 10 years.

New Electric Railways.

NORWALK, OHIO — The Huron County Commissioners have granted a franchise in this county to the Tri-City Inter-Urban Electric Railway Company, which will be built from Ashland to New London.

WASHINGTON, D. C.—The Washington, Arlington & Falls Church Electric Railroad Company is making preparations to extend its present system and cover an area almost twice as large. Beginning at Arlington, it is proposed to run the tracks in a southwesterly direction across the county, through Fairfax County to the Theological Seminary, near Fairfax Court House. The survey of the extension is now being made.

SKANEATELES, N. Y.—There is an effort being made for an electric road to run from Moravia through Skaneateles to Syracuse.

AKRON, OHIO—The Akron Street Railway Company has been given a franchise for a double track between this city and Cuyahoga Falls. When the same are built, cars will be run at frequent intervals. In consideration of the franchise, the company agrees to make extensive improvements on the roadway.

EAST LIVERPOOL, OHIO—The East Liverpool, Fredericktown & Lisbon Railroad Company has been incorporated, with a capital stock of $500,000. They will construct an electric railway, with East Liverpool and Lisbon as termini. The incorporators are Daniel Moynahan, G. A. Steinbrenner, Jonathan Head, S. H. Tolles and F. H. Goff.

TAMAQUA, PA.—Work on the new trolley line at this place is being rapidly pushed, and it is expected that cars will be running over the line in several weeks.

BLUE RIDGE, PA.—The preliminary survey for the Blue Ridge and Waynesboro trolley system has been completed. This line is proposed to be extended from Blue Ridge Summit to Monterey, to Buena Vista, to Blue Mountain, High Rock, Quirauk and to Blue Ridge. Baltimore capitalists are back of it, and say they will build the line to Waynesboro and also one to Hagerstown.

CANTON, OHIO—A route for an electric road from this place, to be called the Canton, Louisville & Alliance Electric Railway, is being surveyed by Pittsburgh parties.

LA SALLE, N. Y. — George P. Smith, of North Tonawanda, has made application for right of way in several streets and over Cayuga Creek, for the Buffalo, Tonawanda & Niagara Falls Electric Railroad.

PORTSMOUTH, VA. — The Portsmouth Street Railway Company has been granted permission to build trolley line in the city.

NEW YORK, N. Y.—Negotiations are reported pending between the elevated railway systems of Brooklyn, and the Manhattan, of New York city, and various electrical companies, for the equipment of all the lines with electric motors for propulsion.

New Telephone and Telegraph Companies.

REDLANDS, CAL.—The Southern California Power Company has just completed a telephone line to the site of their proposed new power-house.

FRANKLIN, KY.—A telephone line is to be built from this place to Schochoho.

MADISON, N. J.—The telephone company is running a line from this place to Afton.

BAYSIDE, L. I.—A franchise has just been granted to the Bayside Telephone and Construction Company to erect poles and string wires for a private telephone service upon the highways in the unincorporated district of this town. The franchise was granted by the Board of Highway Commissioners, and the territory to be covered by the new company will take in the village of Bayside and the outlying districts. A trunk line will run the entire length of Bell avenue, terminating at the Sound, with a branch to the post at Willets Point.

STERLING, KAS. — The Sterling Telephone Company has been incorporated by Melvin E. Richardson, Herbert K. Lindsey, John Anderson, Gustaf A. Anderson and Frank A. Lindquist. Capital stock, $5,000.

GLENCOE, MINN.—The Western Minnesota Telephone Company has been incorporated to establish telephone connections between the principal towns in the western half of the State. Capital stock, $30,000.

COVINGTON, OHIO—The Covington Telephone Company has been granted permission to string wires and operate a new telephone system between this city and Newport.

CHATTANOOGA, TENN.—The telephone line now under construction from this city to Chickamauga, Ga., will be finished in a few days.

NEWTON, KAS.—The poles for the telephone line to Halstead have all been erected, and the work of stringing the wires will be commenced this week. Inside of a week the line will be ready for operation.

DAYTON, OHIO—The Central Union Telephone Company are about to construct a copper metallic line from this place to Greenville, passing through Trotwood, Brookville, West Baltimore, Gordon and Arcanum.

LE SUEUR, MINN.—The B. & E. telephone line has opened for business. It runs from Le Sueur Center, the county seat, to Le Sueur, and at the latter point connects with the Northwestern telephone system.

KINGSTON, N. Y.—The Hudson River Telephone Company have several men engaged in erecting a new telephone line from Sleightburgh to Port Ewen and South Rondout.

NEW ORLEANS, LA.—The Louisiana Telephone, Telegraph and Construction Company, incorporated by J. J. Fowler, president, and others, to establish telephone system, etc. Capital stock, $250,000.

HAGERSTOWN, MD.—R. B. Hazlett, of Norfolk, Va., has been granted franchise for the construction and operation of a long-distance telephone system, etc., to cost $30,000.

New Incorporations.

NEW YORK, N. Y.—United States Electrical Supply Company has been incorporated by William J. Clarke, T. Channon Press and Charles P. Sheridan, to manufacture electrical supplies and erect electrical plants. Capital stock, $10,000.

CHARLESTON, W. VA.—The Hays Construction Company has been incorporated by F. J. Hays, J. K. Hays, O. B. Loose, C. H. Loose and F. J. Clary, for the purpose of constructing railroads, telegraph and telephone lines, etc. Capital stock, $100,000.

LIVONIA, N. Y. — The Livonia Electric Company has been organized, with a capital of $1,500.

NEWARK, N. J.—Articles of incorporation of the Northwest Development Company have been filed. The company will have its principal office in East Orange, and will do business in Alaska, Canada, British Columbia and other places. The objects of the company are to build railroads, gas and electrical works and other improvements, work mines, act as general carriers, and seek and secure openings for the employment of capital, and to dispatch and employ expeditions, commissioners and experts. The capital stock is placed at $100,000. The incorporators are Charles E. Pegley, Jr., and Wentworth B. Winslow, of New York city; W. Percy Mills, of Long Island, and Howard K. Wood, of East Orange.

CAMDEN, N. J.—The Pullen Battery and Electrical Manufacturing Company has been incorporated. The objects of the corporation are to manufacture reversible primary batteries and all kinds of electrical appliances. The capital stock of the company is $100,000, and the amount paid in is $1,000. The corporators are Leon W. Pullen, J. Madison Pullen, of Camden, and Charles L. Klauder and A. E. Bainbridge, of Philadelphia.

CLEVELAND, OHIO—The Cleveland Alternating Lamp Company has been incorporated, with $25,000 capital, by Chas. Caunter, H. E. Collins, Albert J. Barnes, J. A. Davies and E. M. Barnes. They will make electric light lamps under a patent.

NEW YORK, N. Y.—National Car Fender Company has been incorporated. Capital, $20,000. Directors: John A. Henneberry, of 253 Broadway; Matthew Baird, Bernard Mahon, Antonio Rasines, Myer Hellman, Max Cohen and Isaac Macowsky, of New York city.

NEW YORK, N. Y.—The Valley Vital Carbon Brush Company has been incorporated to manufacture commutator brushes and electrical devices. Capital stock, $25,000. Directors: Darius A. Le Valley and John V. Clark, of White Plains; Edward J. Lewis, J. Ralph Hurnett and William J. Creed, of New York city.

Increase of Capital.

NORWALK, OHIO—The Northern Gas and Electric Company has increased its capital stock from $25,000 to $100,000.

ST. LOUIS, MO.—The Imperial Electric Light, Heat and Power Company increased its capital stock from $2,000 to $200,000.

Kindred.... ...Interests

The Western Electric Company is sending out a fine view of Niagara Falls on heavy card-board, with the caption, "A Great Source of Supply." This is typical of what the Western Electric Company is, with its two great electrical supply houses, one in New York and one in Chicago.

The United Gas Improvement Company, of Philadelphia, are erecting at Atlanta, Ga., a water-tower and tank. The tank has a capacity of 10,000 gallons and is supported on a tower 60 feet high. They have let the contract for furnishing and erecting the tank and tower to the Berlin Iron Bridge Company, of East Berlin, Ct.

The Erie Railroad, on its Buffalo and Cleveland train from New York, is equipped with café cars that accompany each train clear through. These cars have all the modern appliances of a first-class café, and are open from 6 A. M. until midnight. These cars contain a smoking-room and baggage compartment, besides dining-room, and are fitted up quite luxuriously. They have become very popular features of the picturesque Erie R. R.

The Pacific Electric Company, of La Crosse, Wis., which manufactures the famous Espersen shade lamp, Espersen dental and surgical lamp, and Espersen eye, ear and throat lamps, for surgical examinations, reports a most gratifying increase in business, shipments having recently been made to Europe and other foreign countries. The Espersen specialties are unique in their originality of design and finish, and the demand for them is constantly increasing.

"Does newspaper advertising pay?" is the question so often asked by the merchant or manufacturer who wishes to get his product before the people. The experience of the big D. C. Cook Publishing Company, of Elgin, Ill., may be of some value to those undecided. Heretofore the company has employed circular letters and postal cards, but now advertises in its own and other papers, believing them to be the best medium of getting before the people. Yet the postage bill of this company in Elgin averages $600 per week.

The electrical house-goods department in the electrical supply business has been more or less neglected during the past few years, owing, largely, to the prominence taken by the electric light and power department of the same business. The Electric Appliance Company, of Chicago, pride themselves upon the fact that the electrical house-goods department of their business has always had good attention, and particularly during the past six or twelve months. The house-goods department in the new issue of their general catalogue is to be exceedingly complete, and the Electric Appliance Company claim that they will list the most complete line of house goods ever catalogued.

KIND WORDS.

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To the Editor of Electrical Review:

On the "Q. T." you have the best paper published in the country. I don't mean to flatter you at all, for all the papers are good friends to me, but there is something so clean, so high-toned about the Review, and it has so much, in fact, *all* the news, and is gotten up in such good business-like shape, that I enjoy it more than all the other papers combined. I am pleased that you are getting your share of business, and certainly wish you continued success.

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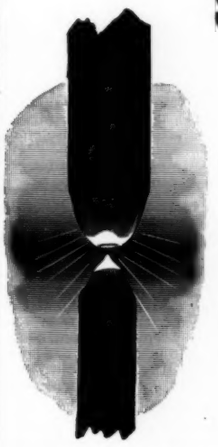

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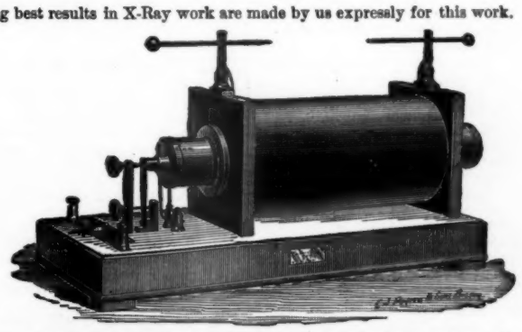

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED JULY 20, 1897.

586,539 Telephone attachment; W. W. Beck, Sebastopol, Cal.

586,543 Connection for electric switches; H. A. Bullard, Pittsfield, Mass.—A supporting means, a tapered opening therein, a detachable tapered plug, a nut loosely carried by one of said parts, holding means therefor, to permit the nut to be freely revolved, said means preventing independent longitudinal movement of said nut with respect to its supporting means, a screw-thread connection by which said parts are attached or detached.

586,554 Flexibly insulated conductor; J. H. Keman, Pittsfield, Mass.—A flexibly insulated conductor for electrical purposes, consisting of an extended length of electric conductor and a coating thereon of oxidized oil varnish such as linseed oil varnish.

586,555 Method of an apparatus for applying Japan; J. H. Keman, Pittsfield, Mass.

586,559 Electrical meter; W. D. Marks, Philadelphia, Pa.—Consists of the actuating coils and the movable member, means for eliminating or reducing magnetic lag.

586,560 Magnetic meter; W. D. Marks, Philadelphia, Pa.—Consists of an oscillating motor, a brake carried by a stationary support, and engaging periodically with a movable member of the motor.

586,575 Lightning arrester for switch boards; A. M. Taylor, Niles, Mich.

586,578 Electrically operated railway barrier; C. C. van der Valk, Haarlem, Netherlands.

586,583 Street-car sign; G. E. Weis, Reading, Pa.

586,584 Head light; Charles Bash, Boston, Mass.

586,590 Air car; A. Brodbeck, Chicago, Ill.—An air car, comprising a gas chamber and a trolley engaging with a feeder wire.

586,602 Conduit electric railway; W. E. M. Jackson, Indianapolis, Ind.—A compressible open spiral, non conductive, a containing cup, a cover and a standard on which said cup and cover are adjustable.

586,606 Circuit controller for electric vehicles; K. Knudsen, Chicago, Ill.

586,615 Electric heater; J. F. McElroy, Albany, N. Y.—A supporting frame for an electrical heater carrying thereon at its upper and lower edges insulating blocks or saddles, a continuous coil arranged in zig-zag fashion about said insulating blocks in such manner that said coils converge from top to bottom and bottom to top, respectively.

586,622 Induction coil for medical apparatus; H. C. Porter, Chicago, Ill.

586,643 Purifying water by alternating electric currents; E. Verstraet, St. Louis, Mo.

586,665 Connector for electrical conducting wires; S. P. Hull, Poughkeepsie, N. Y.

586,679 Combined syringe and electrical apparatus; L. G. Wooley, Grand Rapids, Mich.—An electric apparatus having a primary circuit normally held open by a spring, a lever closing said circuit, and a bag acting as a weight to close said circuit only while the liquid remains in said bag.

586,685 Telephone switchboard; H. V. Hayes, Cambridge, Mass.

586,686, 586,687 Electric furnace; R. F. S. Heath, Camden, N. J.

586,689 Pendent Microtelephone; Franz Muller, Berlin, Germany.

586,702 Electrically actuated switch mechanism; W. S. Browne, Brooklyn N. Y.—Consists of a bar shaped on its lower edge to correspond to the trolley wire section, means for attaching the trolley wire thereto, a longitudinal recess on one side of said bar, extending to and including the central line of the bottom edge, and a plate therein, but insulated therefrom and adapted to be connected by the trolley wheel.

586,729 Method of and apparatus for effecting electrolysis; C. Kellner, Vienna, Austria.

586,755 Telegraph-cable; J. M. Barr, London, England—Consists of a pair of parallel adjacent conductors connected at one end to a common return, a source of current having one pole connected to the common return, contacts connected to the conductors at the transmitting end, and a key connected to the other pole of the source between said contacts.

586,793 Telephone attachment; S. C. Houghton, San Francisco, Cal.—Consists of a support for a telephone receiver movable laterally in two directions and having a swiveled section for supporting and reversing said receiver, duplicate electrical contacts, and means carried by said support for making either of said contacts by adjusting said arm in the appropriate lateral direction.

586,811 Electrical conductor; C. N. Dutton, New York, N. Y.—A multiple wired electrical conductor, having its wires woven around a forked support.

586,813 Electrical gas-alarm; J. Erikson, Providence, R. I.

586,822 Electric furnace; F. J. Patten, New York, N. Y.—A furnace wall, a pair of carbon electrodes inclosed within said wall, one of said electrodes being circular in cross section, means for rotating the arc between and relatively to said electrodes and passages arranged to convey material through the annular arcing space traversed by the rotating arc.

586,823 Electro-magnetic motor; F. J. Patten, New York, N. Y.—A rotary electric motor consisting of a fixed ring field magnet energized by multiphase alternating currents provided with an internally eccentrically pivoted armature of magnetizable material tangentially in contact with the ring field magnet internally at one pole thereof, and adapted to follow the rotating magnetic field by rolling around the inside periphery of the ring.

586,824 Electric furnace; F. J. Patten, New York, N. Y.

586,825 Electric motor; F. A. Perret, Brooklyn, N. Y.—Consists of a driving wheel and stationary axle, an armature directly connected with the wheel, a commutator support mounted directly on the armature, a field magnet mounted directly upon the stationary axle, and a brush support mounted directly on the field magnet.

586,845 Electro-magnetic third-rail system; W. Grunow, Jr., Bridgeport, Ct.—An electrical contact system, consisting of a free or independent reciprocating electro-magnetic contact, operated by the alternate action of a separate electro-magnet and gravitation.

586,852 Underground system for electric railways; A. S. Krotz, Springfield, Ohio—A feeding conductor and a contacting rail, a support common to both, an insulator to which said support is attached, and a lip or shield on said support, and between said insulator and said contacting rail.

586,888 Telephone signaling relay and circuit; A. S. Williams, Newton, Mass.

586,891 Electrical signaling apparatus; A. A. Anderson, Altoona, Pa.

586,894 Electro-depositing device; J. Bossard, Dubuque, Iowa—Consists of a tank, with anode connection, a circular carrier, having cathode connections from which a number of articles to be deposited upon are suspended within the bath and means for causing the carrier to rotate in a horizontal plane, carrying the articles to be deposited upon around in the bath.

586,920 Electric railway system; H. P. Wellman, Ashland, Ky.

586,933 Electric switch; J. F. McElroy, Albany, N. Y.

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586,957 Brush holder; N. M. Beede, Schenectady, N. Y.—Consists of an opening for the reception of a commutator brush, a brush movable in said opening, a flexible connection leading from the brush and a spring clamp secured to the flexible connection, and making electrical connection with the body of the brush holder.

586,986 Electric arc light reflector; C. M. Bolles, Dallas, Tex.

586,993 Telephone system; G. Dillberg & Parnell Rabbidge, Sydney, N. S. W.—Consists of the speaking circuit, the call circuit, an induction coil having its primary and secondary coils in series in the speaking circuit and an armature controlled by said induction coil to control the call circuit.

586,995 Form for winding coils for dynamo-electric machines; H. Geisenhoner, Schenectady, N. Y.—Consists of means for giving the coil a shape while winding that is substantially the same as that of the finished article, and means for finally shaping the coil before removing it from the form.

587,002 Electrically-operated locking device for elevators; T. W. Jenkins, Philadelphia, Pa.—A car with a power-controlling wheel and a door, a lock for said wheel, an electric circuit with magnet controlling said lock, and contact-points connected by the action of said door, said parts being combined.

587,004 Telephone exchange; M. G. Kellogg, Chicago, Ill.

587,018 Telautograph; L. O. McPherson, Highland Park, Ill.

587,015 Electric meter; G. F. Packard, Fort Wayne, Ind.

587,024 Rectifier; Elihu Thomson, Swampscott, Mass. The improvement in the art of rectifying alternating current, which consists in passing the current through a rectifying device and by external power imparting to the rectifier a tendency to rotate at a speed greater than synchronism.

587,062 Electric bell; J. T. O'Brien, Bridgeport, Ct.

587,073 Car step; A. Blum, Cincinnati, Ohio.

587,080 Calling appliance for telephone switchboards; F. R. McBerty, Downer's Grove, Ill.

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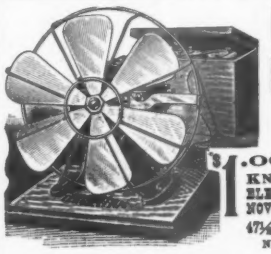

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